The Electrical Industry's Weekly Magazine

June 10, 1957

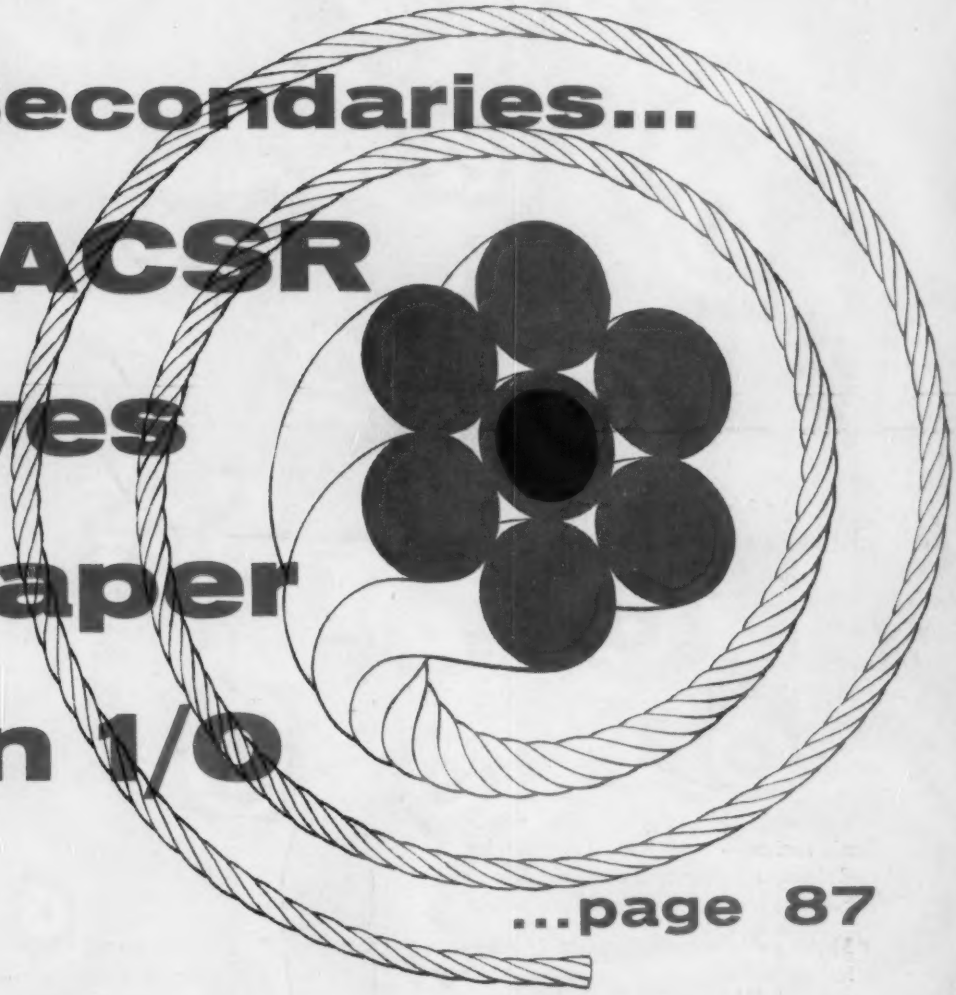
Electrical World

Price 50 Cents

A McGraw-Hill Publication

For Secondaries...

2/0 ACSR Proves Cheaper Than 1/0



...page 87

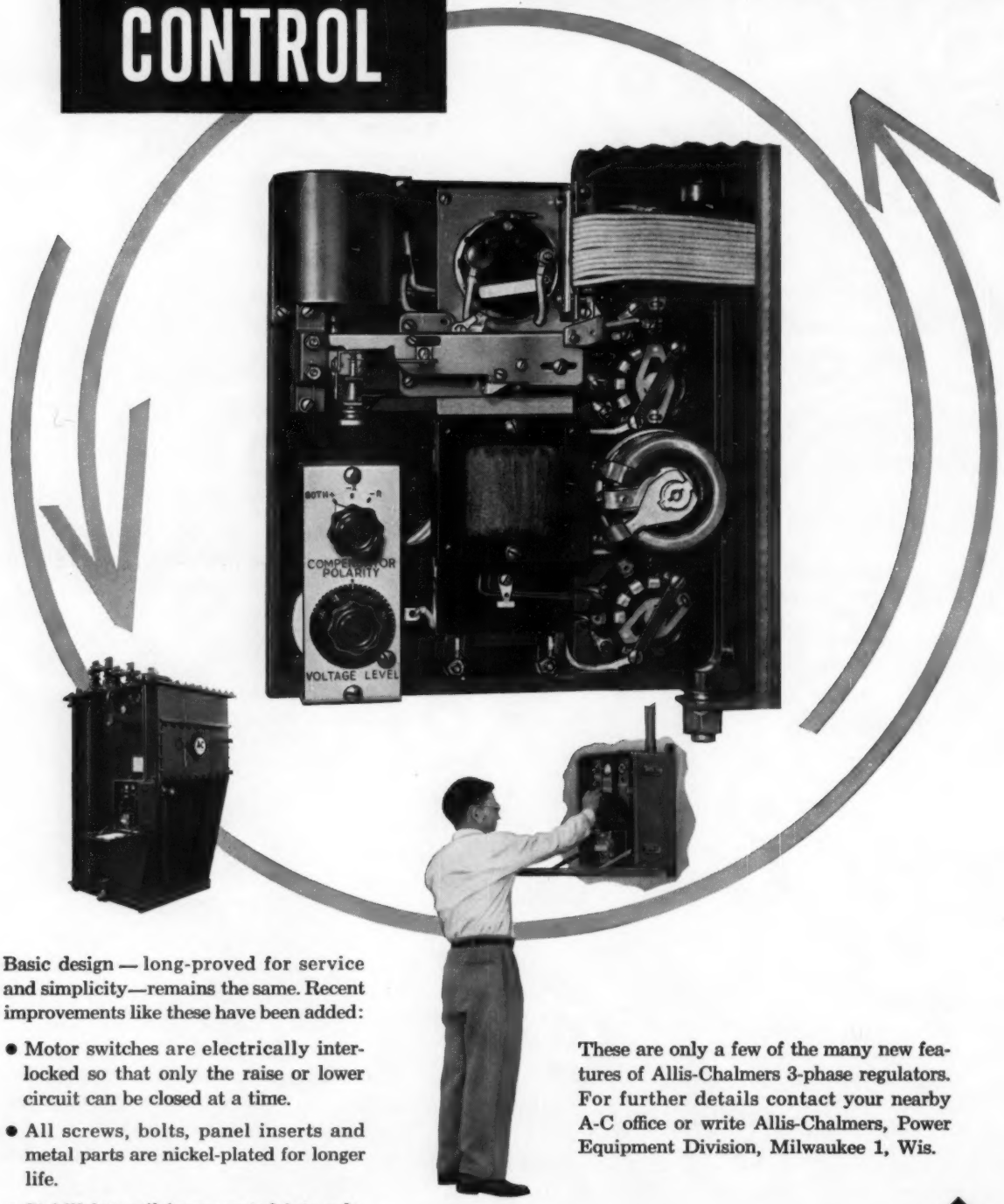
At EW's Right-of-Way Conference:

Buy Ahead for Room to Grow . . . Page 68

E B POWER GS &
UNIVERSITY MICROFILMS
313 N 1 ST
ANN ARBOR MICH

continued improvements in 3-phase regulators

CONTROL



Basic design — long-proved for service and simplicity—remains the same. Recent improvements like these have been added:

- Motor switches are electrically interlocked so that only the raise or lower circuit can be closed at a time.
- All screws, bolts, panel inserts and metal parts are nickel-plated for longer life.
- Stabilizing coil incorporated into solenoid of voltage-regulating relay.
- Rustproof plastic coating on open edges of control cabinet.
- Handy control diagram on inside cover.

These are only a few of the many new features of Allis-Chalmers 3-phase regulators. For further details contact your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.

ALLIS-CHALMERS

A-5408

Electrical World

Vol. 147, No. 23 JUNE 10, 1957

Published for 83 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

Features

CURRENT NEWS

Start on Tomorrow's R/W Problems Now

Utilities not acquiring sites and rights-of-way five years in advance are courting trouble.....p 68

Eisenhower Ponders AEC Appointment

Democrats keep pressure on to reappoint Thomas E. Murray, but AEC Chief Strauss opposes move.....p 70

DISTRIBUTION

2/0 ACSR Rated More Economical Than 1/0

Load growth enables 2/0 to overcome higher initial cost; study determines spans per transformer.....p 87

GENERATION

Remote Control Shuts Down Hydro Plant

Air cylinders on brakes stop units by remote control and oil is locked in receivers of governing system.....p 82

METERING

Design Efficiency Into Precision Watthour Meter

Instrument is self-checking, stable in operation and its data from ±1,000 count close to wattmeter accuracy.....p 85

TRANSMISSION

Old Quarry Becomes Tower Test Site

British convert it into unique station for testing transmission structures; walls ideal for windless loading.....p 80

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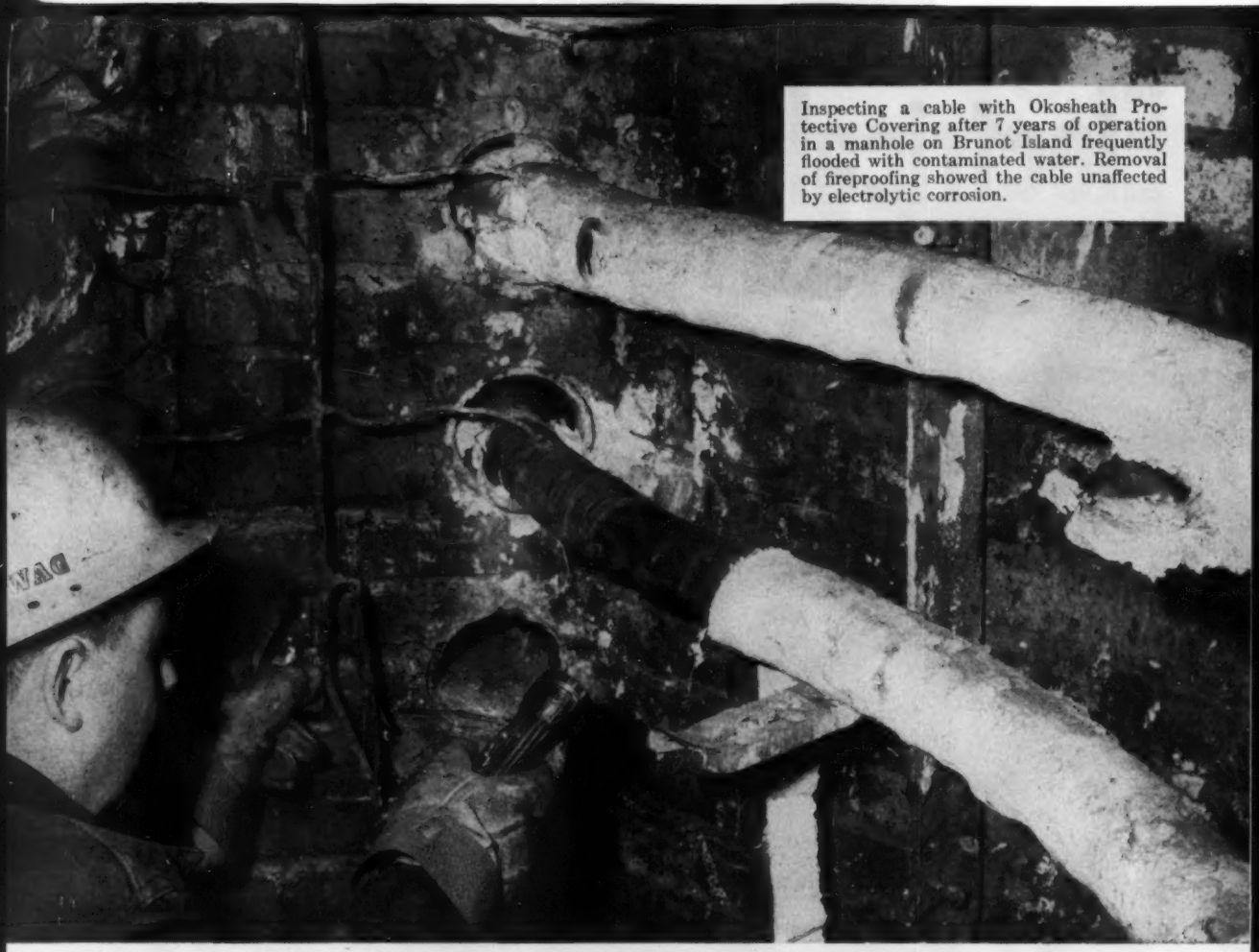

Inspecting a cable with Okosheath Protective Covering after 7 years of operation in a manhole on Brunot Island frequently flooded with contaminated water. Removal of fireproofing showed the cable unaffected by electrolytic corrosion.

How Duquesne Light Company solved lead-sheath corrosion

Duquesne's Pittsburgh generating station on Brunot Island in the Ohio River had long been plagued with cable failure due to electrolytic corrosion of lead sheaths. River and rain water seepage through cinder fill caused this electrolytic action. Since it was impossible to do away with the cinder fill, the only solution was a cable not vulnerable to corrosion. Okosheath Protective Covering supplied the answer. When bonded by vulcanization to an Okometal alloyed lead sheath, this tough jacket of reinforced Okoprene provides a dual-sheath protection that prevents chemical and electrolytic corrosion and possesses greater fatigue resistance than plain lead sheath. So pleased was Duquesne that existing cables for the 50 distribution circuits originating on the Island were pulled out and replaced with protective sheath cable—30,000 feet in all. A large part of this had Okometal Sheath with Okosheath Protective Covering.

Since completion of the change to protective sheath cable, there has not been a single cable failure due to electrolytic corrosion despite the fact that water and acids are always present in the manholes and duct system. Duquesne considers their problem to be completely solved and are quite enthusiastic about the installation. This is understandable when you consider that several regular lead-sheath cables failed at this location after only a short duration.

Okometal-Okosheath cable can double the life expectancy of plain lead-sheathed cables. Why not let your Okonite representative give you full details on this type of cable. Write today to The Okonite Company, Passaic, New Jersey. 4989

where there's electrical power . . . there's **OKONITE CABLE**

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. . . *from the publisher*

If you were at EEI's convention last week, somewhere along the line you had your morning coffee over a copy of the "Unconventional Daily."

Since its first issue back in 1947, this daily newspaper of convention doings has become as much a part of the meetings as the Coffin Award and the President's Reception.

Every day stories are written, pictures are taken. Then through the night presses roll, turning out some 2,000 copies for distribution the following morning.

As a publishing venture, the "Unconventional Daily" is somewhat unique:

1. It is issued only three days a year;
2. It is probably the most highly localized daily newspaper in the country. Its readers are all in the same business, all in the same town, and all under one roof.

This once-a-year shift of our operations from a weekly to a daily cycle requires the full time of five Electrical World staffers. Ken Kost, the "Unconventional's" chief editor, opened printing negotiations as early as last January, set up shop in Chicago a week ahead of the convention.

Last Thursday the "U.D." was packed up for another year. When its next edition appears the dateline will read Boston, Mass., June 9, 1958.

Fischer Black

ELECTRICAL WORLD

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NOW!...*Finally!*...Here's a method all wrapped up in

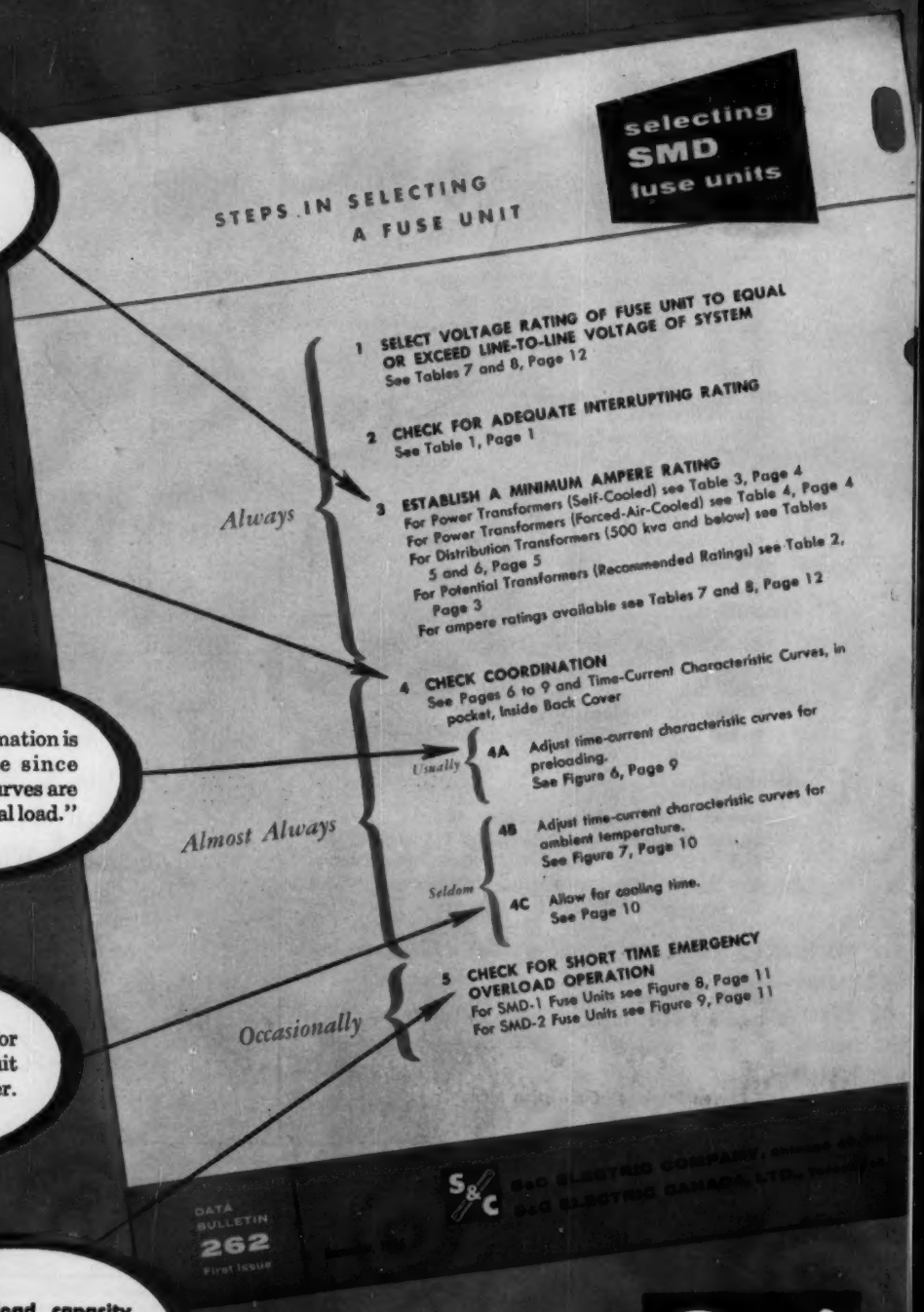
New ampere rating recommendations give maximum protection for transformers with precise allowances for short-time daily overloads.

Two methods of coordination are offered: Rule-of-thumb and Precision.

Preloading information is made available since Time-Current Curves are based on "no initial load."

How to compensate for successive short-circuit operations of the breaker.

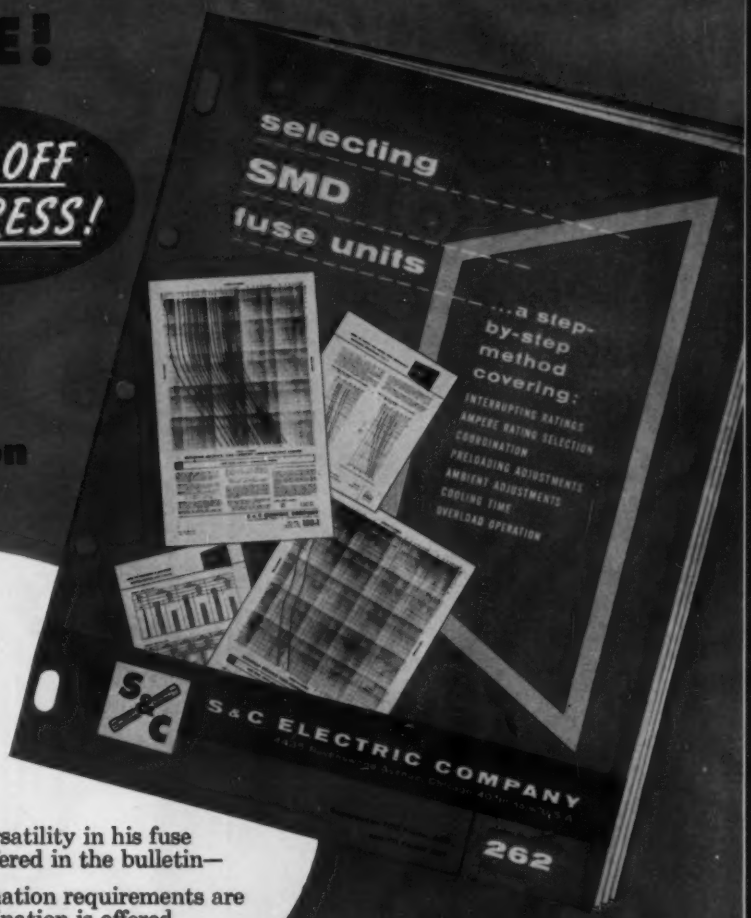
Fuse overload capacity information is given here for the first time anywhere.


selecting SMD fuse units
STEPS IN SELECTING A FUSE UNIT
Always
1 SELECT VOLTAGE RATING OF FUSE UNIT TO EQUAL OR EXCEED LINE-TO-LINE VOLTAGE OF SYSTEM
See Tables 7 and 8, Page 12
2 CHECK FOR ADEQUATE INTERRUPTING RATING
See Table 1, Page 1
3 ESTABLISH A MINIMUM AMPERE RATING
For Power Transformers (Self-Cooled) see Table 3, Page 4
For Power Transformers (Forced-Air-Cooled) see Table 4, Page 4
For Distribution Transformers (500 kva and below) see Tables 5 and 6, Page 5
For Potential Transformers (Recommended Ratings) see Table 2, Page 3
For ampere ratings available see Tables 7 and 8, Page 12
Almost Always
4 CHECK COORDINATION
See Pages 6 to 9 and Time-Current Characteristic Curves, in pocket, Inside Back Cover
Usually
4A Adjust time-current characteristic curves for preloading.
See Figure 6, Page 9
Seldom
4B Adjust time-current characteristic curves for ambient temperature.
See Figure 7, Page 10
4C Allow for cooling time.
See Page 10
Occasionally
5 CHECK FOR SHORT TIME EMERGENCY OVERLOAD OPERATION
For SMD-1 Fuse Units see Figure 8, Page 11
For SMD-2 Fuse Units see Figure 9, Page 11
DATA BULLETIN 262 First Issue
S&C

for power fuse coordination
ONE PACKAGE!

JUST OFF THE PRESS!

it frees you from hocus-pocus; it gives you more fuse protection



The key to this method is a step-by-step sequence as shown at the left (the first inside page of the new Data Bulletin 262).

For each step, all the necessary data is at your finger tips. You have a choice of two methods—

for the man who wants more range and versatility in his fuse coordination, a "precision" technique is offered in the bulletin—

for the man-on-the-go, whose fuse coordination requirements are not so rigorous, the "rule-of-thumb" coordination is offered.

Write today for your copy of this 12-page-plus-cover Data Bulletin 262, with necessary TCC curves.

S & C Power Fuse Type SMD, illustrated below: vertical style 69 kv.

Specialists in High-Voltage Circuit Interruption Since 1910

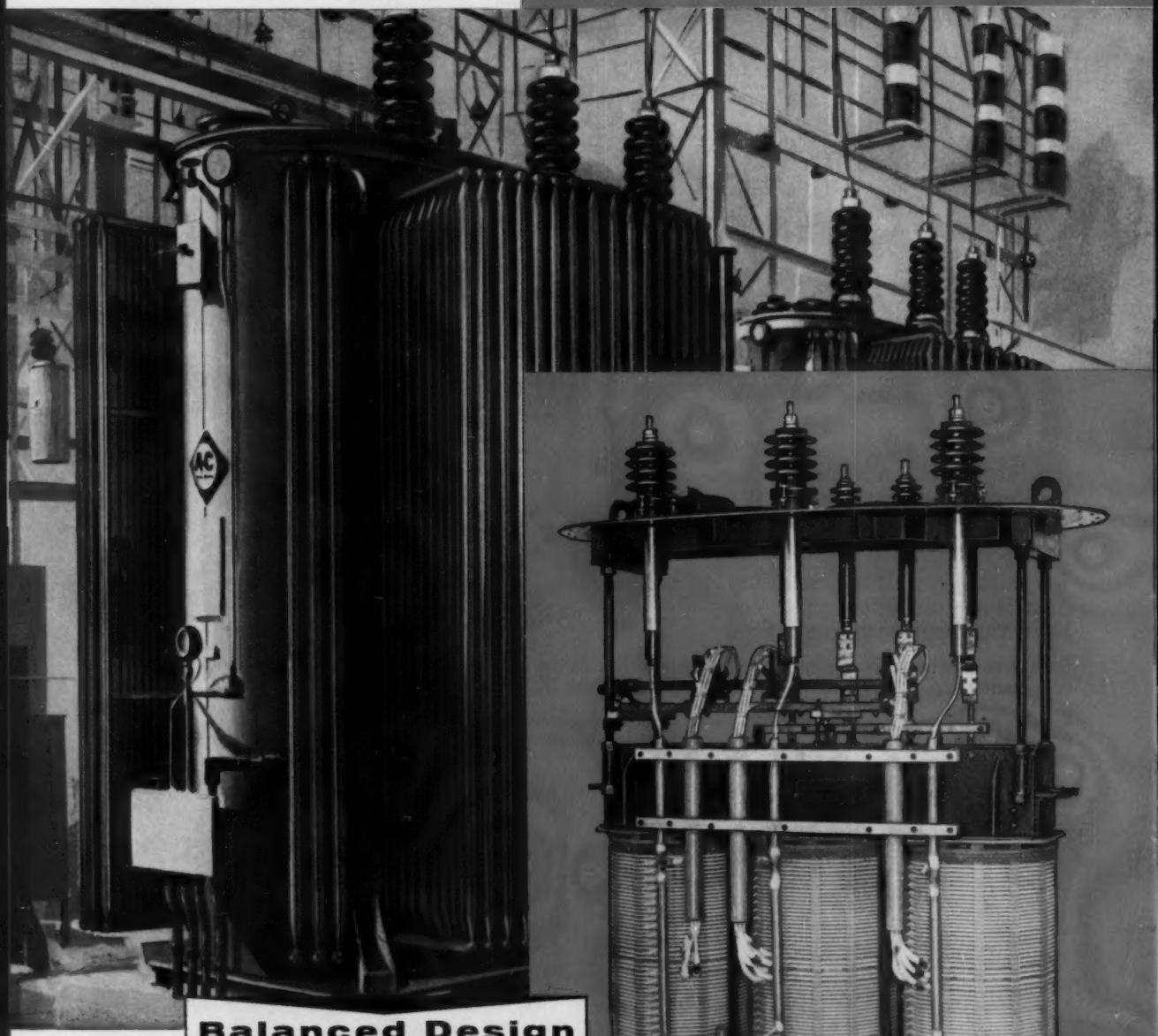
S&C ELECTRIC COMPANY

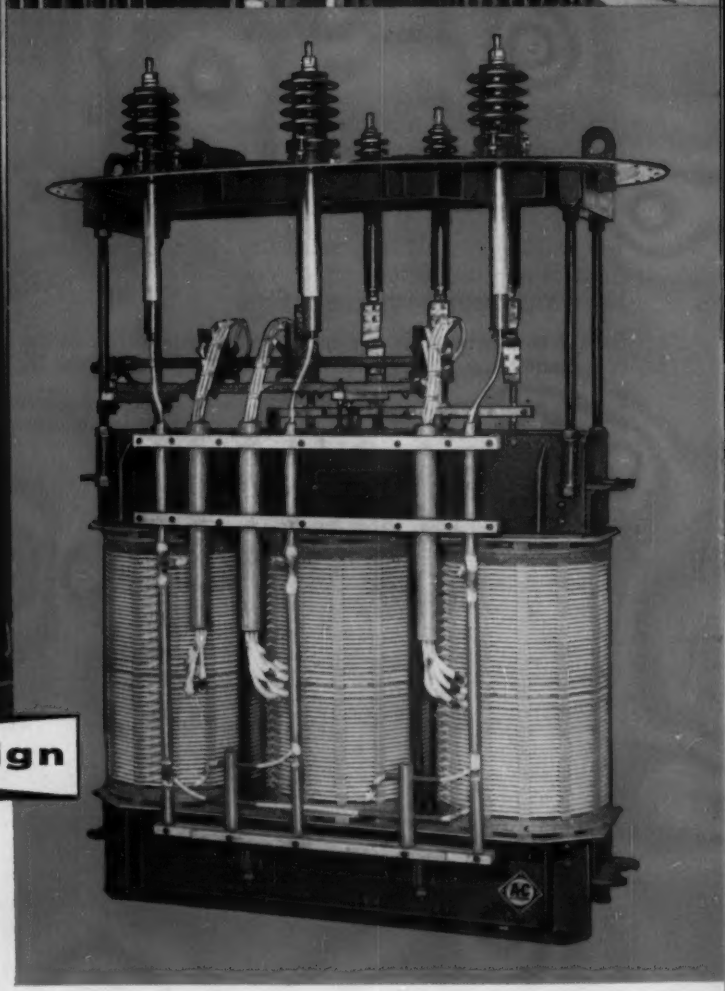
In Canada: S & C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ontario

POWER FUSES • DISTRIBUTION CUTOUTS AND FUSE LINKS • LOAD INTERRUPTERS • METALCLAD SWITCHGEAR

ALLIS-CHALMERS
POWER TRANSFORMERS

Engineered





Balanced Design

...means **MORE** for your Transformer Dollar

With electrical equipment replacement costs increasing, it's more important than ever to insist upon maximum transformer value. In Balanced Design, features such as corona-free insulation, low gradients, and uniform cooling complement each other to provide outstanding dependability and long transformer life. Get all the facts. Call your nearby Allis-Chalmers office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-

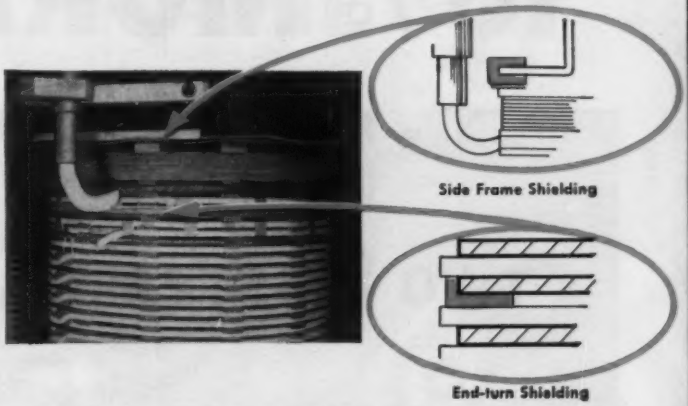
to stay young

Here's Why

1

Corona-Free Design
gives insulation long life

Creeping paralysis caused by corona can't take the life of this transformer. Advanced insulation practices, dimensional properties, proper coordination between solid and liquid insulation materials prevent concentration of dielectric fields and keep corona from forming.

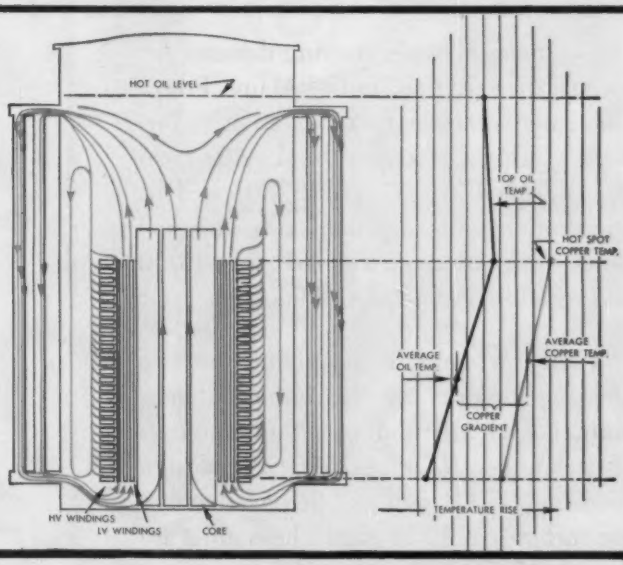


Shown are just two of many shielded areas that protect windings from the overstresses of lightning and switching surges.

2

Low Gradients
thorough cooling lengthens service

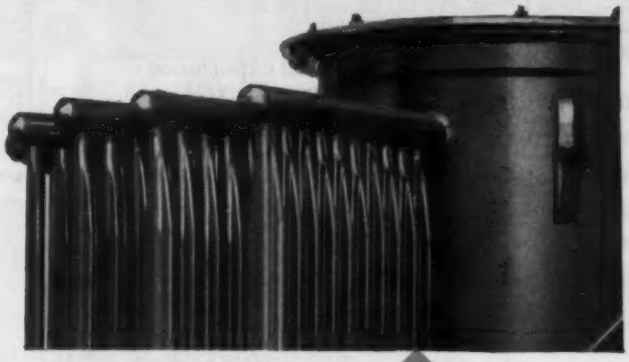
Temperature gradients are lower—hot spots are minimized in Allis-Chalmers transformers. Assembly is built for rapid cooling. Coils permit cooling oil to flow through and around all layers. Special core spacers on larger units allow oil to flow through core structure. Insulation coordination and uniform cooling increase insulation life and multiply the value received for each transformer dollar spent.



3

New Radiator Design
cuts maintenance

Fewer parts—simplified shape facilitates inspection . . . there are no nooks and corners where dirt and corrosion get in their destructive licks. Painting costs are reduced. More uniform cooling (with less floor space requirements) extends transformer life.



CHALMERS

A-C ALLIS-CHALMERS

A-5398

Now Under Construction...

18% MORE POWER

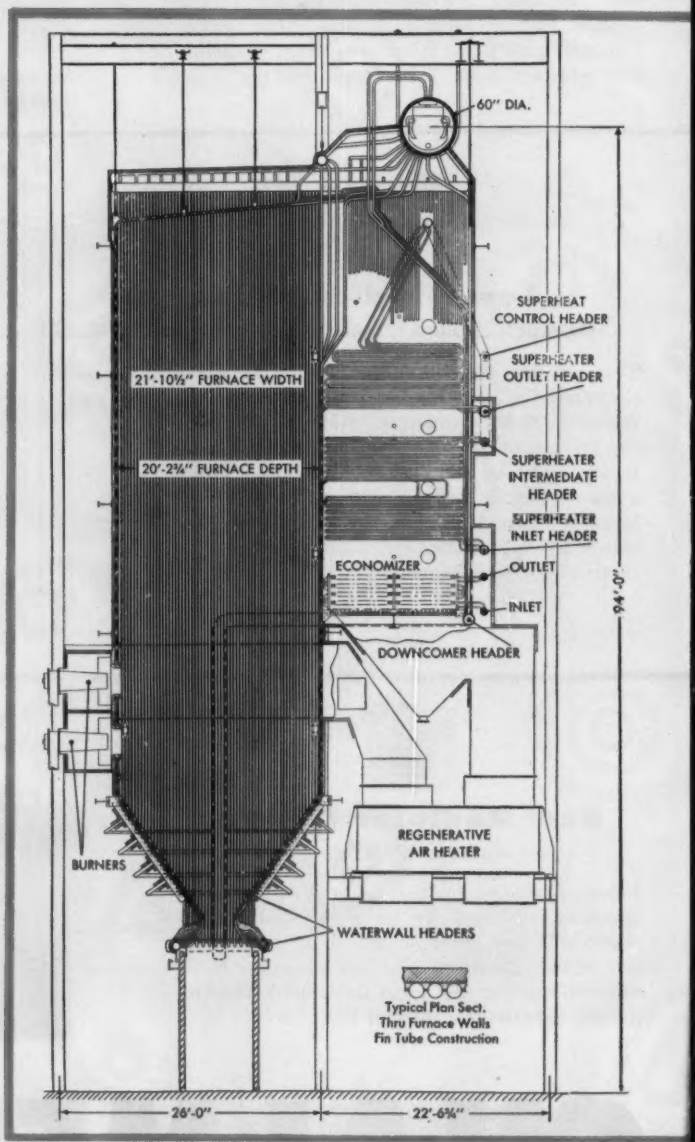
New 88,000-kw Yarmouth Station will be served by

TWO FW STEAM GENERATORS

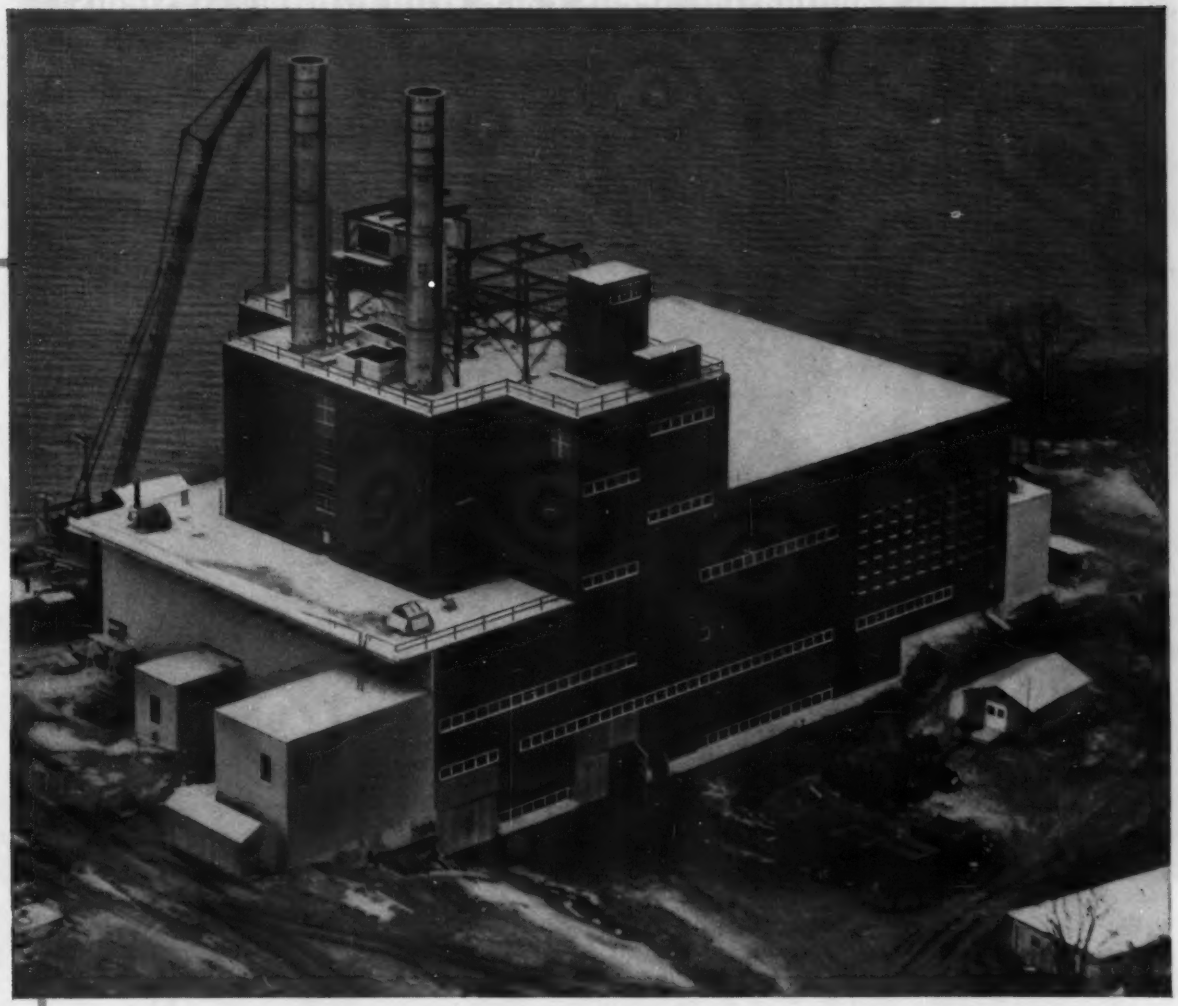
To meet Maine's growing demand for electric power, the Central Maine Power Company is building a new station at Yarmouth which increases total system capacity from 470,730 to 558,730 kw. This installation will consist of two identical units, each with a rated capacity of 44,000 and capability of 50,000 kilowatts.

Foster Wheeler is supplying the two steam generators for this important new station. Each will produce 490,000 pounds of steam per hour at 1575 psig design pressure, 950 F, and will deliver steam to the turbines at 1250 psig. These units are designed for either oil or coal firing.

With more than fifty years of experience in steam generation—and the finest modern manufacturing facilities in three large plants — Foster Wheeler welcomes the opportunity to quote on your requirements. *Foster Wheeler Corporation, 165 Broadway, New York 6, N. Y.*



for CENTRAL MAINE



An aerial view of the new Yarmouth Station of Central Maine Power Company. Unit No. 1 is scheduled to be in operation this year and Unit No. 2, in 1958. During the past decade, virtually every kind of Maine business has drastically increased its kilowatt-hour use of electric power. The Yarmouth Station will keep CMP well ahead of this growing demand — immediately increasing total system capacity by 18%.

FOSTER WHEELER

NEW YORK • LONDON • PARIS • ST. CATHARINES, ONT.

ON THE LINE...

New Hubbard Faultmaster Keeps Pace With Growing Systems!

Small bore single vent tube provides high pressure positive expulsion. Fibreglass reinforcing assures long tube life.

Proper application of fuse cutouts is greatly simplified by the use of the new Hubbard Faultmaster. The design leads the industry with a new single vent, small bore, fibreglass-reinforced fuse tube. Flippers, flying caps, tricky vents and other remedial accessories are not required. Without "blind spots," the Faultmaster is able to clear faults from a few amperes through its maximum rating. Future obsolescence can be avoided now, for the great flexibility of the Faultmaster provides superior protection for today's system and, without extra cost, has the built-in-reserve for operation on the system of tomorrow.

Unique, high strength recoil members and husky fasteners absorb, minimize and distribute the stresses of high fault interruption over the sturdy, solid porcelain column. The entire current path is silver plated and current transfer points are under spring pressure. Springs are made from non-aging materials and designed to operate well below their elastic limit to insure positive contact pressure throughout the useful life of the cutout. All working parts are of corrosion free non-ferrous materials. Get the full story today from your Hubbard distributor or write for a copy of Bulletin P-756.

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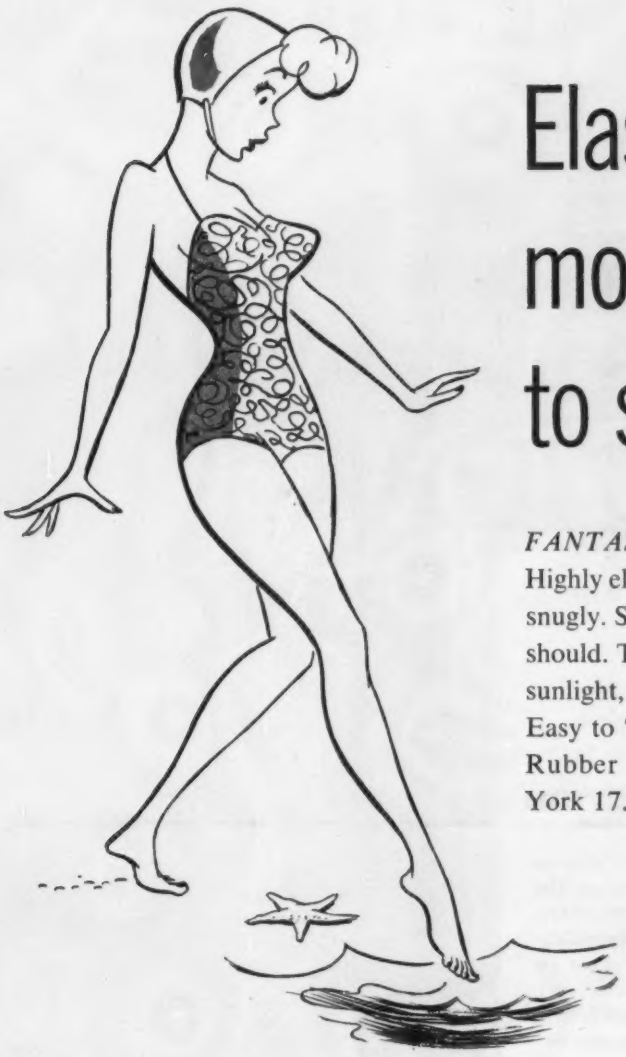


Elastic— molds to shape

FANTASTIC? No, Gold Seal *Plastic* Tape. Highly elastic, it "flows" on to cover any surface snugly. STICKS and STAYS like a quality tape should. Tough plastic defies water, oil, solvents, sunlight, and weather. In handy 20 foot rolls. Easy to "swing" in tight places. Jenkins Bros., Rubber Division, 100 Park Avenue, New York 17.

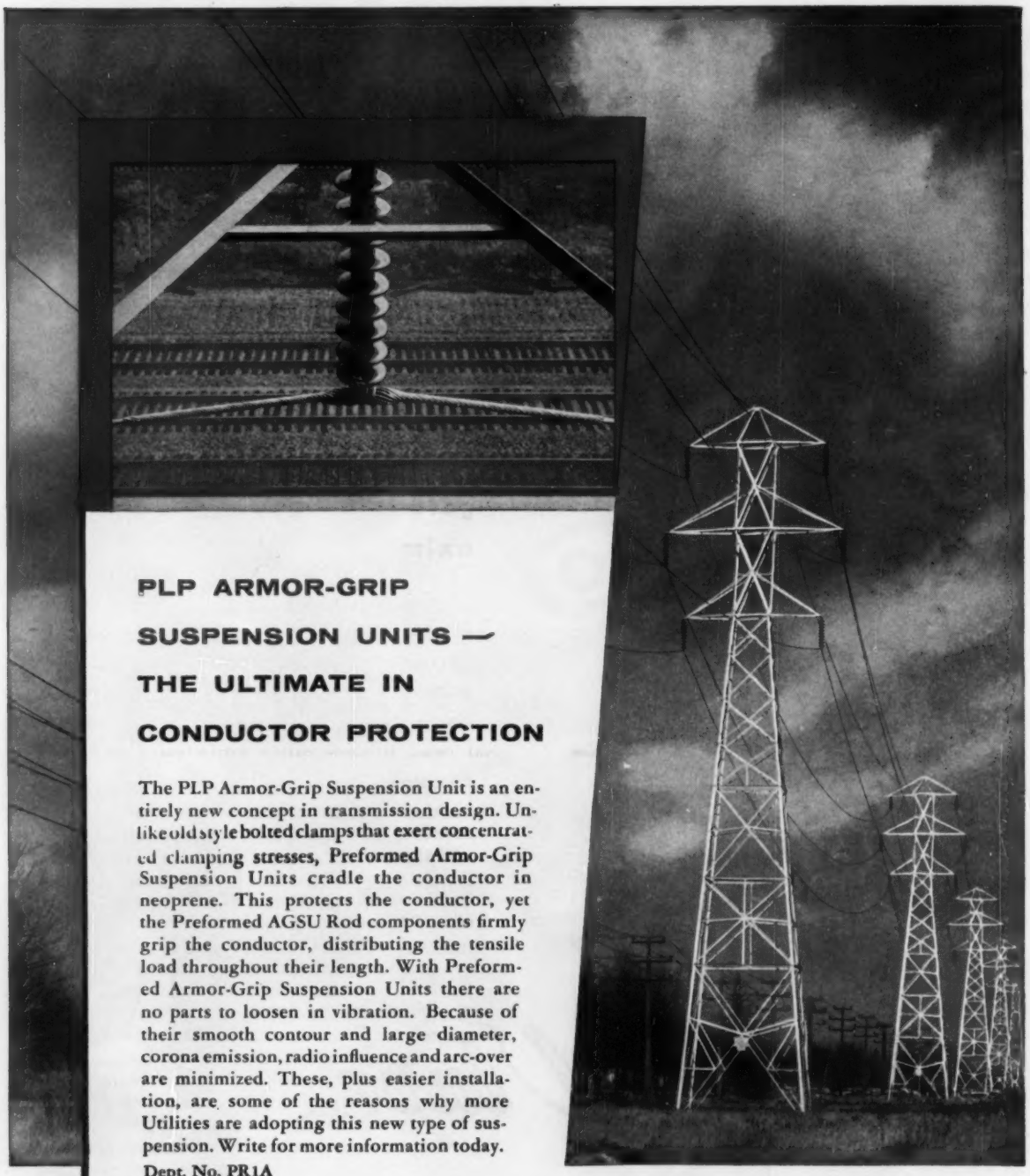
Gold Seal Tape

IN HANDY 20 FOOT ROLLS

Ten 20 ft. rolls in the Handy Pack can.

Single 60 ft. rolls in individual metal cans.

Gold Seal FRICTION — RUBBER — PLASTIC TAPES . . . Commercial and Specification Grades



PLP ARMOR-GRIP SUSPENSION UNITS — THE ULTIMATE IN CONDUCTOR PROTECTION

The PLP Armor-Grip Suspension Unit is an entirely new concept in transmission design. Unlike old style bolted clamps that exert concentrated clamping stresses, Preformed Armor-Grip Suspension Units cradle the conductor in neoprene. This protects the conductor, yet the Preformed AGSU Rod components firmly grip the conductor, distributing the tensile load throughout their length. With Preformed Armor-Grip Suspension Units there are no parts to loosen in vibration. Because of their smooth contour and large diameter, corona emission, radio influence and arc-over are minimized. These, plus easier installation, are some of the reasons why more Utilities are adopting this new type of suspension. Write for more information today.

Dept. No. PR1A

PX-79

PLP Armor-Grip Suspension Units support these 132 KV Cleveland Electric Illuminating Company lines.

PREFORMED LINE PRODUCTS CO.

5349 ST. CLAIR AVENUE • CLEVELAND 3, OHIO

Telephone: Cleveland EXpress 1-3571

Made in accordance with or for use under one or more of the following U. S. Patents: 2,722,393; 2,275,019; 2,587,521; 2,609,653; 2,691,865; other patents pending

It takes **KEARNEY QUALITY** in fuse links to give you positive protection... close coordination

FUSE LINKS FIELD-TESTED
Here at KEARNEY's Substation Laboratory of 150,000 KVA Transformer capacity—with a back up power of 445,000 KVA—all equipment is tested under rigorous field conditions. KEARNEY Certified Ratings are not theoretical calculations... but actual, proved performance ratings.

controlled manufacture, rigorous testing provide maximum service continuity

Quality control in KEARNEY Fuse Links starts with design... and continues through careful selection of materials, precision parts manufacture, expert assembly and strictest inspection and testing. The end result is dependable protection... *uniformity* that guarantees all Fuse Links of the same rating will perform exactly alike.

ALL KEARNEY Fuse Links feature low temperature operation. Pure tin elements or low melting point solder, selected for proper strength and melting temperature for each current rating, keep temperatures inside the cutout tube well below charring point. This provides accurate, positive arc clearance even after long periods of overload.

Take care of your requirements in Specialized and Standard Fuse Links with KEARNEY... best you can buy! Contact your KEARNEY Representative.

JAMES R. KEARNEY CORPORATION
General Offices: 4236 Clayton Ave., St. Louis 10, Mo.

379

for BETTER CONSTRUCTION
SAFER MAINTENANCE
Specify

JAMES R. KEARNEY CORPORATION ST. LOUIS, MO. GUELPH, ONT.

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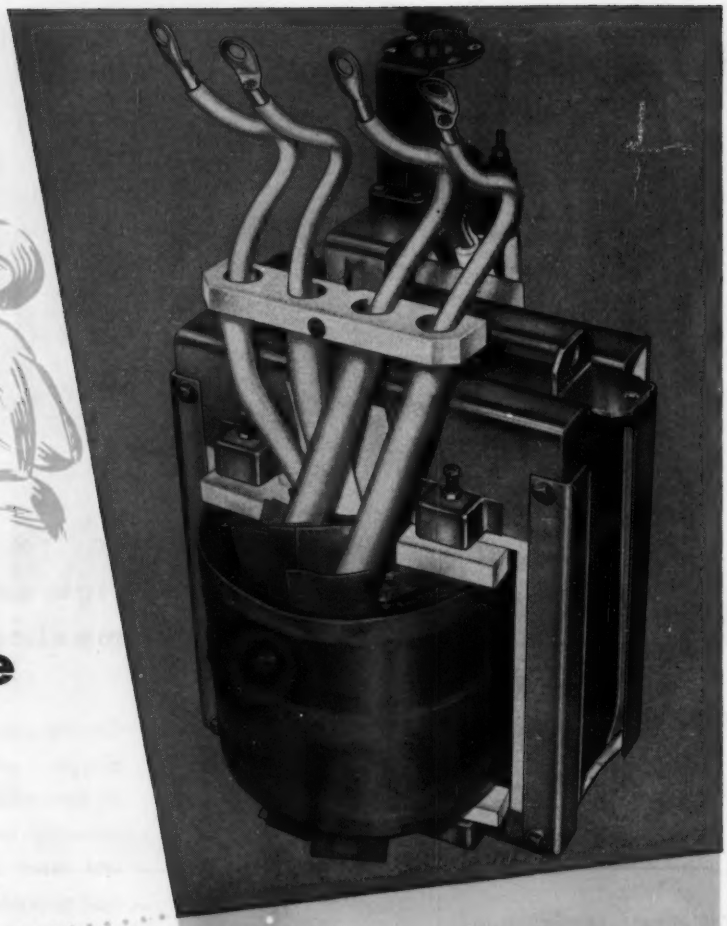
Plants at: ST. LOUIS · FAYETTEVILLE, ARKANSAS · SHENANDOAH & CLARINDA, IOWA — GUELPH, ONTARIO, CANADA

Wire Sculpture by Henry Szafarz



Rugged Performance

built into core and coil assembly of Central Distribution Transformers

Only the best raw materials, design, workmanship and inspection go into core and coil assemblies of Central Distribution Transformers.

Grain oriented, cold rolled steel is used in the wound core design. Maple blocks are attached to the sturdy frame on all core and coil assemblies, 15 KVA and above, to prevent shifting of the coil under overload or short circuit conditions.

The tap changer has a glazed porcelain body and high conductivity copper alloy contacts. The molded bakelite handle extends above the hot oil level to assure easy and positive operation of the high pressure spring loaded contactor. A fiber board provides clear indication above oil of the position of the tap changer.

This rugged construction of the core and coil assembly is an important reason why Central Distribution Transformers have gained wide acceptance in the Electrical Industry.

A type for every need—from the smallest to the largest.

Designers and Manufacturers of Transformers only

CENTRAL
TRANSFORMER CORP.
PINE BLUFF, ARKANSAS
Sales Offices in principal cities

Wire Sculpture by Henry Szafarz

It's Another World . . .

one in which the forces of nature are extremely rough on man-made things. Thus, the simple fact that Simplex supplies more submarine cable than all other manufacturers combined speaks volumes as to product quality. Simplex Submarine Cables are specifically engineered for reliable underwater communication and power transmission. Their many varieties of outer coverings, wire armor, heavy jackets of Neoprene and other materials, guard against underwater hazards and assure long, dependable service.

SIMPLEX WIRE & CABLE CO.,
79 Sidney Street,
Cambridge 39, Mass.

Photo of Transoceanic Telephone Cable, Cut Back to Show Construction

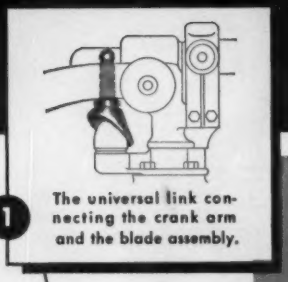
LIVE BETTER ELECTRICALLY

Simplex

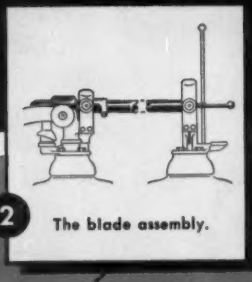
ELECTRICAL NEWSLETTER

ONLY 3 MOVING ELEMENTS

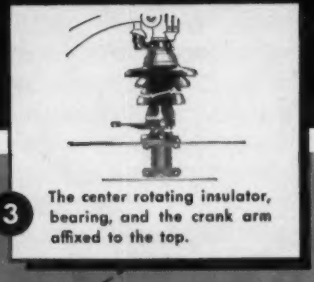
Operate the type WAG high pressure switch



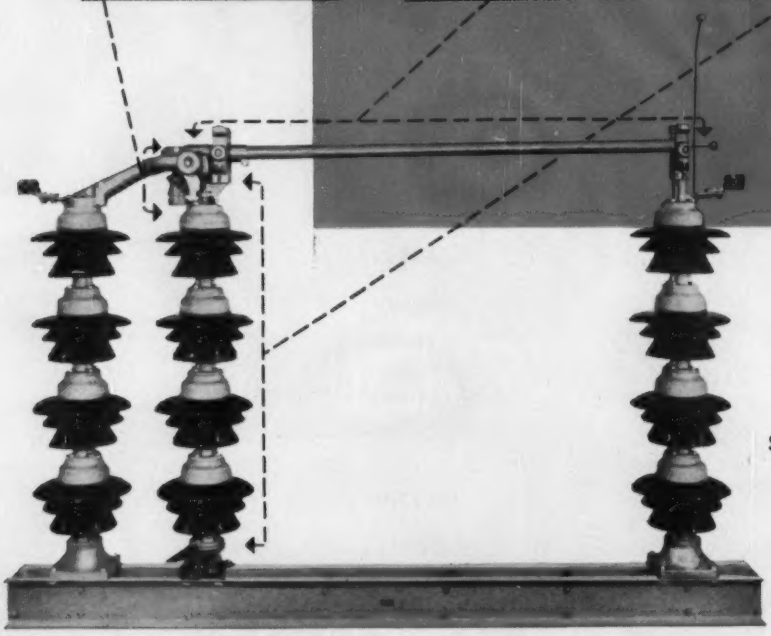
1 The universal link connecting the crank arm and the blade assembly.



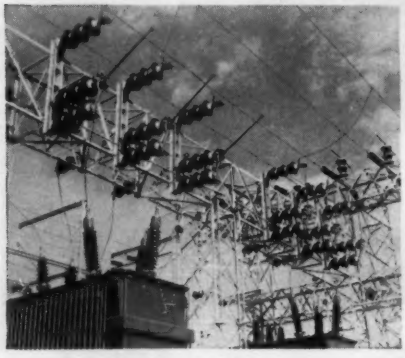
2 The blade assembly.



3 The center rotating insulator, bearing, and the crank arm affixed to the top.



AMPLITACT CONTACTS ARE AVAILABLE TO MEET UNUSUALLY HIGH SHORT CIRCUIT CURRENTS.



An extremely simple operating mechanism gives the Type WAG High Pressure Air Break Switch a superior mechanical advantage, which assures complete dependability under all climatic, operating, and atmospheric conditions—a fact proved by years of continuous service on applications in every section of the nation. The three moving elements are factory set to preclude any possibility of maladjustment.

Ease of operation, positive blade control, high contact pressure and wide contact deflection, plus a host of other outstanding features add up to unsurpassed performance and economy. Get all the facts in Bulletin 390-R, which we'll gladly send on request. Then you, too, will specify Southern States Type WAG Switches.

SS

SOUTHERN STATES EQUIPMENT CORP.

HAMPTON, GEORGIA

IN CANADA: Dominion Cutout Co., Ltd., Toronto

NEWS-SCOPE

AT EEI MEETING ▶ **Donald S. Kennedy was re-elected president** and J. Wesley McAfee was re-elected vice president of Edison Electric Institute.

Elected to head EEI's Atomic Energy Committee was Elmer Lindseth, president of Cleveland Electric Illuminating . . . E. M. Naughton, president, Utah P&L, is named Steering Committee chairman of Electric Companies Public Information Program . . . Robert Zachary will become consultant and special representative for National Assn of Electric Companies upon retiring from Public Service E&G later this year.

Board votes to poll members on amendment to by-laws which would permit Latin American power companies to be represented in EEI. If current members approve, resolution would allow affiliate membership to Latin Americans.

Awards at EEI meet: American Gas & Electric wins coveted Coffin Award. . . Four Utah P&L linemen win Claude A. Matthews Valor Award for battling treacherous mountain snows in minus 20F weather to repair vital communications line . . . Northern States Power takes grand prize in Reddy Kilowatt contest for annual reports.

Should electric companies engage in basic nuclear research? Allen Van Wyck, president, Illinois Power, told EW: "I have offered to contribute substantial sums of my company's money. In this, I have the authorization of my board to contribute 1% of gross income for five years as part of a general program of nuclear research by the industry. I would prefer to contribute to research on reactors without tying in turbines and generators."

LATE NEWS ▶ **Federal officials urge Indiana private and cooperative** electric utilities to join forces to study the state's power needs. The advice followed Indiana PSC's recent plea to Agriculture Secy E. T. Benson to reject Hoosier Cooperative Energy's request for a $42-million federal loan to build a generating plant. PSC contends the project would cause duplication of facilities.

FPC finds a group of electric companies incorrectly charged certain expenses in connection with two booklets but asserts there is no need for Congressional legislative action. Meanwhile, Rep Earl Chudoff (D-Pa.) and Sen Estes Kefauver (D-Tenn.) continue probes to unearth proof of tax avoidance or evasion by utilities.

Permit to build an underground nuclear reactor is granted General Dynamics by AEC. Test reactor, located near San Diego, would be shielded by earth on three sides, face a canyon on the fourth.

Congratulations . . . George R. Armstrong rises from executive VP to president of Louisville G&E . . . Superior Water, Light & Power has made L. A. Nichols president . . . J. Luther Davis is upped to vice president of Tucson Gas, Electric & Light . . . AG&E Service Corp elevates S. N. Fiala to vice president-chief engineer.

EVENTS ▶ **Tomorrow's right-of-way problems call for acquisition** of sites and R/W at least five years in advance and legislation permitting recourse to state commissions on zoning matters. These are among suggestions and ideas from Electrical World's R/W Meeting last month in Chicago **(p 68).**

John Fletcher Rich takes the reins at New England G&E Assn. A specialist in corporation finance, the new president says one big problem today is earning a rate of return capable of meeting inflationary conditions **(p 71).**

ATOMIC PROGRESS ▶ **Power reactor radiation may be scrutinized after fallout hearings,** judging from Congressional interest in exploring industrial use and output of radioactive materials. Scientists' testimony included comments on degree of Strontium 90 in reactor process **(p 72).**

WASHINGTON ▶ **Thomas E. Murray, frequently the lone dissenter** among Atomic Energy Commission members, has nonetheless gained some strong arguments for his reappointment. Supporters say another Murray term would placate Congressional Democrats and avoid a lengthy donnybrook on naming a successor **(p 70).**

GENERATION ▶ **How to still hydro units and retain governor system oil:** This was the question facing Northern State Power men when they installed remote shut-down controls on 3,000-kw Apple River plant. They solved it with solenoid-actuated air-cylinder controls on the turbine-generator shaft and similarly operated diaphragm valves in oil lines between governor and receiver **(p 82).**

TRANSMISSION ▶ **You may have an ideal site for tower testing** if a quarry hole has been abandoned in your area. The British have capitalized on a 150-ft-deep cavity. It affords still air conditions for horizontal loading to 30 tons. Twelve geared-down winches apply loads slowly **(p 80).**

DISTRIBUTION ▶ **Despite higher first cost, 2/0 ACSR proves cheaper** in long run than 1/0 for growing residential distribution. This is Indianapolis P&L conclusion after studying economic size and length for open secondary on racks. With pole loading of 10 kva, for example, costs of 2/0 and 1/0 even out after 3 yr of load growth. In next 2 yr, 2/0 savings compensate for higher expense of first 3 yr. Savings then accrue for remaining conductor life **(p 87).**

Mobile transformer van keeps service continuity while banks up to 300 kva are replaced. Jersey Central P&L adapted a box-type body for 1½-ton trouble rig, then mounted three dry-type 100-kva single-phase transformer in a case to avoid interruptions **(p 95).**

METERING ▶ **Calibration of portable rotating standards is gained** with efficiency and high accuracy at PS of New Mexico. They take the mean value

of indications from a three-unit precision watthour meter and thereby establish a higher order of accuracy **(p 85).**

RELAYING ▸ **Maintenance costs on control-circuit tests are cut** by a "stand-in" oil circuit breaker developed by TVA's lab and test branch. It has a two pole magnetic trip, manually reset, trip-free air circuit breaker with 15-amp contacts **(p 100).**

HEATING & COOLING ▸ **The 61 radiant glass panels heating a Michigan plant** pulled a 34.8 kw max demand last winter. In first 71 days of operation, degree days totaled 2,499. A "Demantrol" limits demand to 50% of installed load **(p 106).**

SELLING ▸ **Live Better Electrically, Housepower condition big market** for Southeast utilities' sales allies. Continuing industrial expansion brings intensive promotion, tie-ins with architects, dealers, and contractors **(p 104)** . . . Pennsylvania feed mill processes 400 tons daily with only 50 men. Heart of the automated setup is a feeder control panel that regulates quantities by a pre-set formula **(p 108).**

MANAGEMENT ▸ **Do you use "rouse power" in customer relations work?** Is a worker with "a jet-propelled attitude toward ideation" getting recognition he should? If not, PEA's provocative customer contact session provides some tips **(p 78).**

Outlook for the second half is bright, despite doldrums in housing, autos, and appliances **(p 139).**

PEOPLE ▸ **At Maine Public Service Co, C. Hazen Stetson is new president.** He succeeds Samuel W. Collins who becomes board chairman . . . Mississippi Valley Public Service Co names E. H. Finkelnburg board chairman, S. J. Pettersen president-general manager, and N. J. Fischer vice president-operations . . . James F. Crist becomes Southern Electric Generating Co head . . . At Texas Power & Light, T. D. Thomas is elected VP **(pp 146-148).**

MANUFACTURERS ▸ **Babcock & Wilcox has supplied American G&E a boiler** designed for 3-million lb per hr steam capacity with 3,625 psi at superheater outlet. B&W's boiler division says it's the largest one ever built . . . Argentina is on the market for $30 million of equipment **(p 132).**

NEW EQUIPMENT ▸ **A cluster mount that handles capacitors up to 50 kvar** clamps directly to 7 through 14-in. poles without putting a hole through the wood. Manufacturer says you just assemble gear on the ground, hoist it as a unit, and attach with a pole band and a couple of carriage bolts . . . Hydraulic derrick features 360-deg rotation and within 15-deg vertical elevation. It has aerial lift attachment with platform for OH work **(p 110).**

ENGINEERING TRENDS

Radiation exposure from an atomic blast can be estimated from its effect on photographic films in stock. Fogging of this film provides an approximate measure of radiation dispersion throughout an area, according to National Bureau of Standards. . . . A new detector of radioactive combination tells in 15 sec where nuclear workers have "hot" material.

Ultimate success of a microwave system, once it has been properly installed and tested, depends upon developing specially trained personnel and a well-planned program for testing and maintenance. Equipment installation well ahead of service date is essential.

One mile of cable boosts switching-surge energy as much as 50 miles of overhead line. Prevalence of cable on subtransmission systems, and the wide-spread use of shunt capacitors, often subjects lightning arresters in the 3-to-73-kv range to switching surges far greater than would be anticipated for the relatively short lines they are installed to protect.

Minimum flaw in alloy-steel rotor forgings detectable with ultrasonic tests is of a diameter approximately half the wave length of the test frequency. But higher frequencies are more affected by attenuation in the forging and structural reflections may mask discontinuities.

Emphasis on high-speed excitation to bolster transient stability tends to decline with increasing use of high-speed relays and circuit breakers to cut fault duration and the much greater synchronizing power of tightly integrated, interconnected systems.

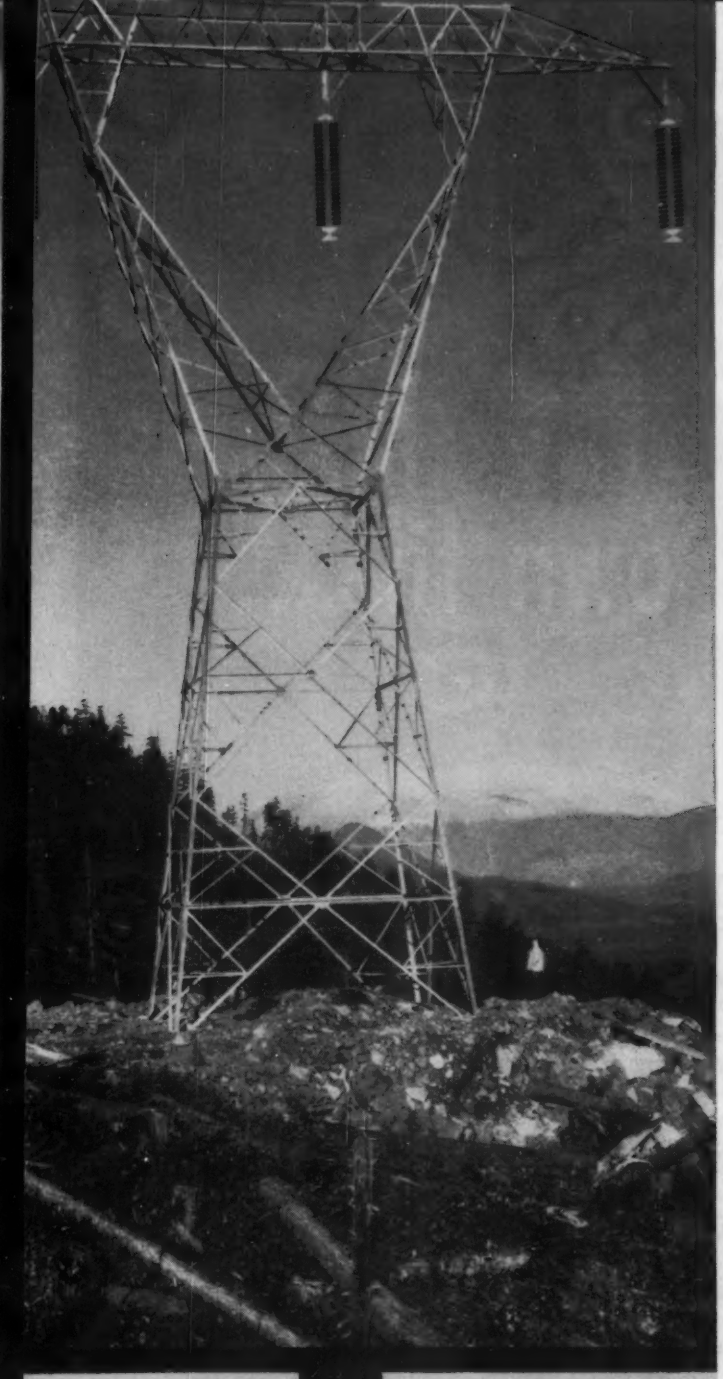
Shield wires and masts, as applied to transmission and substations, do not completely eliminate the possibility of direct strokes reaching station insulation. Protection applied according to travelling-wave theory sometimes proves inadequate when a direct stroke near the substation sneaks inside the accepted shielding angle to terminate on a conductor and stress its insulation far beyond expected levels.

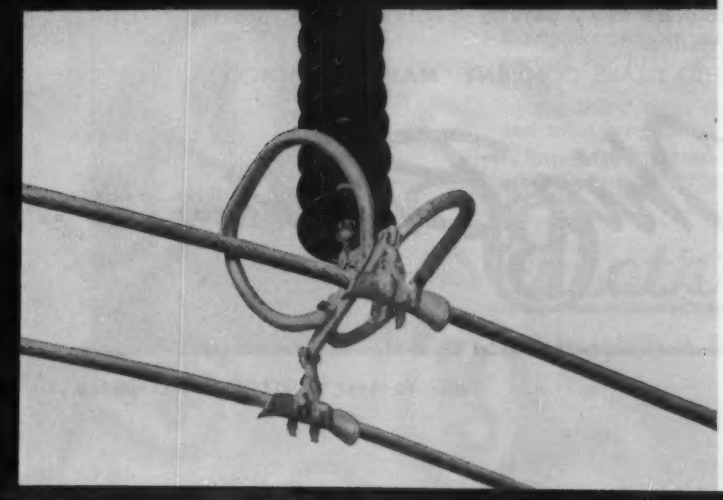
Immediate re-loading of a generating unit after emergency tripout has a probability of about 10%.

FROM EDITORS IN THE FIELD

Boiler feed pump is steam-turbine driven in Appalachian Electric Power Co's new Glen Lyn Plant unit. This 6,230-hp, 5,610-rpm drive is said to be the first of "fully integrated" type to go into commercial operation.

Coal-car rocking will be a gentle pulsation imparted by a grip on the car side at South Carolina E&G Co's McMeekin Station. Operation will be quiet and economical because overhead structures are eliminated.





How to build a 345-kv line with 230-kv Corona and RIV

British Columbia Electric does it, with an assist from C-O-B

"Give us corona characteristics and radio influence voltage for 345-kv transmission that is no higher than would normally be expected for 230-kv."

That was the problem posed to Canadian Ohio Brass by British Columbia Electric Company back in 1950 when B.C.E. decided to establish an extra-high-voltage grid operating at 345-kv, the first system at this voltage in North America using a two-cable, horizontally spaced conductor bundle.

Tests were conducted by O-B to determine bundle spacing and type of hardware needed to meet the RIV and corona level specified. One of the important findings: the mutual shielding effect of the two conductors lowered radio influence level. Also, standard conductor clamps in the suspension position met the radio requirements. For the insulator string, tests showed it was desirable to provide shielding rings to redistribute voltage in the conductor end of the string.

This is typical of the help Ohio Brass has provided power companies that build or plan EHV transmission lines. With the cooperation of our customers, we've already found many answers to EHV transmission problems. If you have any special problems pertaining to insulator or hardware performance at EHV, we're confident they can be solved, too. Probably we have already made most of the required tests.

So if you're considering EHV in your system, there's no need to wait. We can help you get the benefits of EHV transmission right now.

OHIO BRASS COMPANY, MANSFIELD, OHIO
CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.

Ohio Brass

4756-H

for the largest number

for the facts that prove the value of O-B station-type insulators

Station-type insulators are standardized. That makes them all alike--some think!

Your own experience doesn't bear this out, we'll wager. Some last longer than others. Since they all cost about the same, this simply means some are worth more than others. Standards don't tell *all the story.*

O-B can make some fancy claims about its insulators, but there's a better way of bringing the story home to you. It would be unusual if there weren't hundreds, maybe thousands, of O-B station insulators on your system. Look-up the record--*your record*--of *our* product.

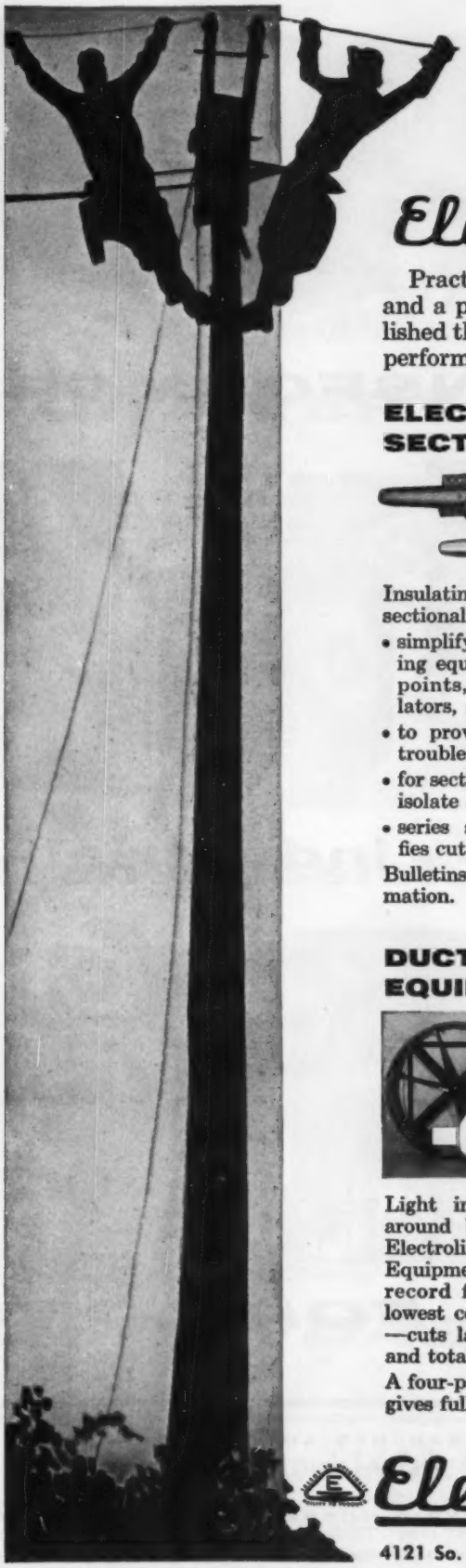
The facts are in your file, right now, in your own language, on your own terms. They will prove the point that no standard applies to getting your money's worth!

And you'll find it pays to specify O-B insulation for your stations.

OHIO BRASS COMPANY MANSFIELD, OHIO

Ohio Brass

4797-H

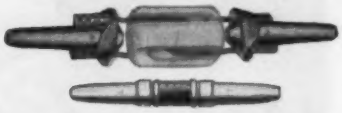


for the largest number of line applications, at the lowest possible cost . . .

Electroline Products

Practical experience designed these Electroline Products; and a practical habit of keeping close tab on costs has established them as first in the field—for top quality and economical performance.

ELECTROLINE SECTIONALIZERS

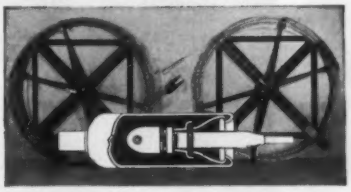


Insulating automatic line splice sectionalizers:

- simplify cutting-in of regulating equipment—disconnecting points, fuses, voltage regulators, series capacitors, etc.
- to provide points to test for trouble
- for sectionalizing networks—to isolate and test area in trouble
- series street lighting—simplifies cutting-in series lamps

Bulletins contain complete information.

DUCT-RODDING EQUIPMENT



Light in weight, feeds easily around bends, easy to handle. Electroline Steel Duct-Rodding Equipment has an extraordinary record for high efficiency at lowest cost. A big money-saver—cuts labor cost, original cost and total investment.

A four-page illustrated brochure gives full information.

AUTOMATIC LINE SPLICES

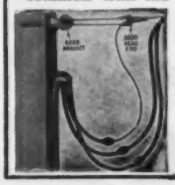
It is well said of these simple, rugged units—"They go on in no time; they hang on for all time." Easy to install—and their mechanical strength exceeds the rated breaking strength of the conductors. Ideal for restoring service.

AUTOMATIC DEAD-ENDS

In a typical "torture" test for strength, gripping and vibration damping features, 100,125,000 recorded vibrations did not develop any sign of failure of conductor in these rugged dependable Dead-Ends. Engineers call it equivalent to 50 years of ordinary service.

Electroline Service-Drop Automatic Dead End. The "3800" Series for holding pre-assembled service cable using a bare neutral conductor as the messenger.

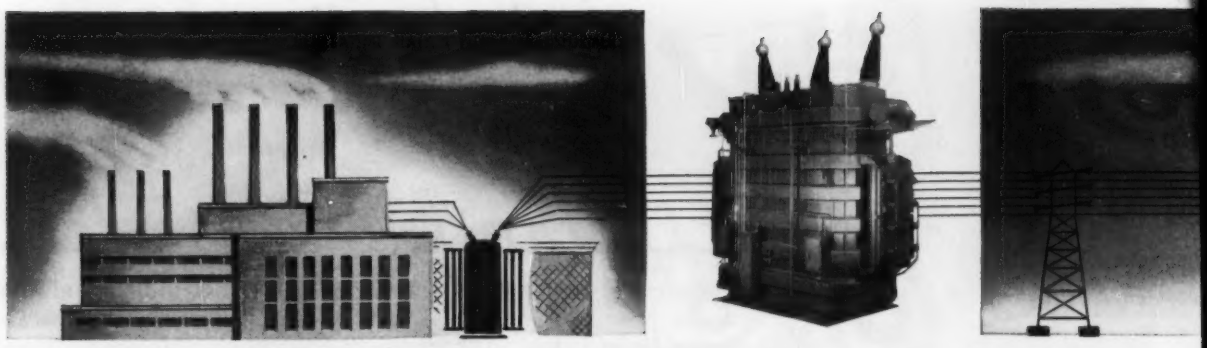
The method of gripping the bare neutral employed by this ELECTROLINE Anchorage eliminates the danger of short circuiting the phase wires so common with the use of concentric cable clamps.



ELECTROLINE Service-Drop Anchor Bracket. The "4000" Series for securely supporting the cable at any angle.

Electroline Company

4121 So. LaSalle St., Chicago 9, Ill. *In Canada:* POWERLITE DEVICES, LTD., TORONTO

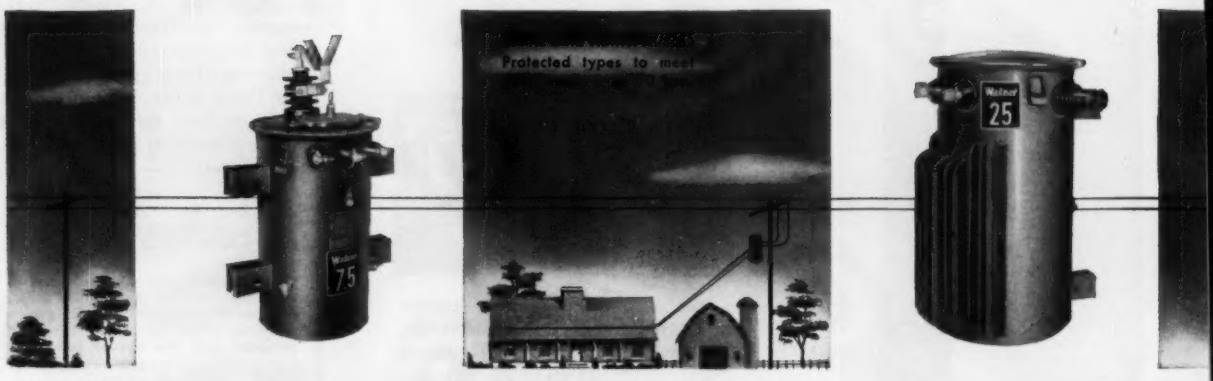


WAGNER TRANSFORMERS

SMALL DRY-TYPE TRANSFORMERS
Single-phase and three-phase. 1 to 300 kva, 600 volts and below.

VENTILATED DRY-TYPE LOAD CENTER TRANSFORMERS
Wagner also builds Nitrogen sealed dry-type transformers.

Central Station - - Industrial - -



ENGINEERED FOR LONG

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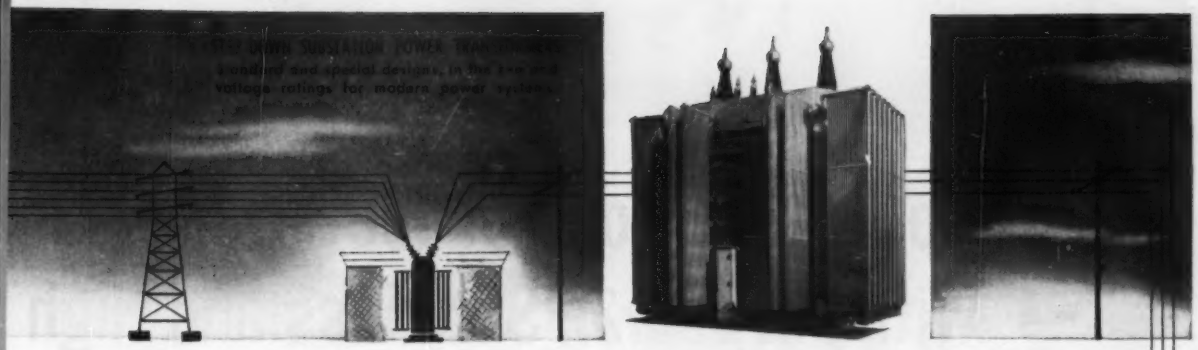
Wagner Electric Corporation
SERVING INDUSTRY SINCE 1891

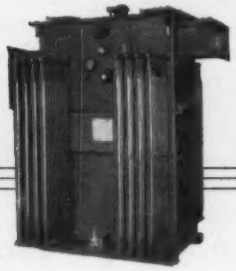
BRANCHES AND DISTRIBUTORS
IN ALL PRINCIPAL CITIES

ELECTRIC MOTORS • TRANSFORMERS •

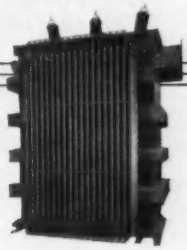


FOR EVERY NEED . . .

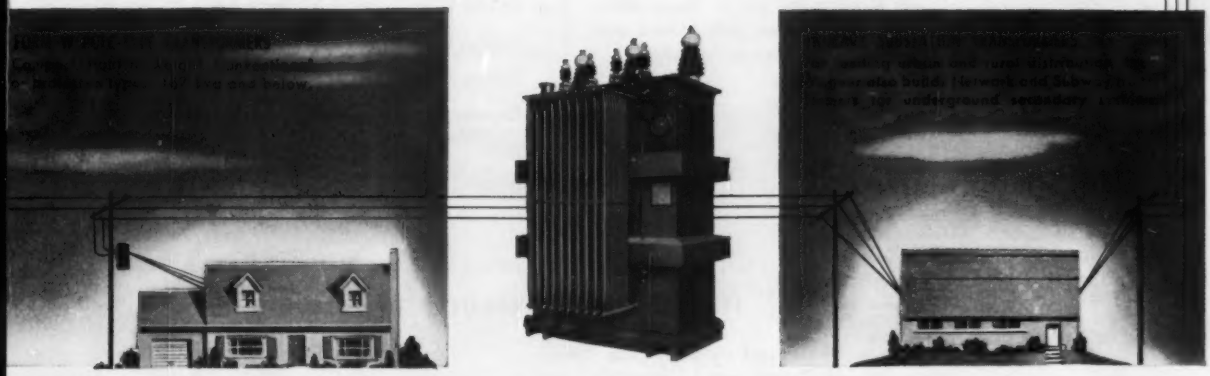
UNIT SUBSTATION TRANSFORMERS
Oil-filled and Noflamol (non-inflammable liquid)-filled.



INDUSTRIAL SUBSTATION POWER TRANSFORMERS
Medium sized transformers built to ASA Standards C57.12b.



Transmission - - Distribution



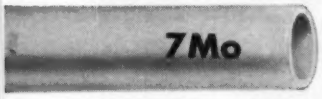
DEPENDABLE SERVICE

Wagner Electric Corporation
6456 PLYMOUTH AVENUE, ST. LOUIS 14, MO., U.S.A.

LIVE BETTER ELECTRICALLY

INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR & HYDRAULIC

You get millions of feet of nuclear with *Carpenter* Stainless and High



● Carpenter's role in harnessing the atom, first for wartime use and later for national defense and peacetime uses, began during World War II. For nearly 15 years, Carpenter has cooperated with the AEC and prime contractors on many of the nation's top nuclear energy projects, supplying millions of feet of stainless and high alloy tubing and pipe for these installations.

Carpenter's leading role in the nuclear energy field is shown by the following applications: Carpenter supplied stainless tubing and pipe for Hanford Works' first production facility; the first finned tubing used by the AEC at Hanford Works; 100 miles of tubing supplied for the Dana Project; square-shaped tubing to Argonne National Laboratory for a boiling water reactor; and many more.

Significant Carpenter developments include the first successful use of welding to produce stainless and special alloy tubing and pipe . . . the origination of Schedule 5 pipe . . . super corrosion-resistant Stainless No. 20Cb . . . titanium tubing and pipe . . . long lengths of Alloys B and C . . . and stress corrosion-resistant 7Mo Stainless Tubing and Pipe.

More than 30 analyses of tubing and pipe can be and have been supplied for nuclear energy plants

Carpenter experience in producing millions of feet of tubing and pipe for nuclear energy requirements embraces these standard stainless analyses and specialty high alloys:

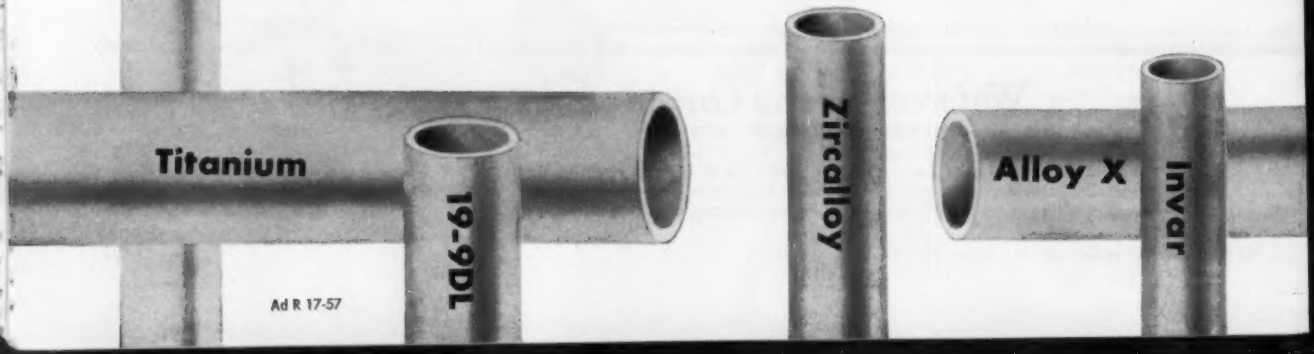
304	310	317L	348
304L	316	318	430
309	316L	321	442
309S	317	347	443
309S-Cb			

SUPER STAINLESS AND HIGH ALLOY GRADES

Zircalloy II	*Hastelloys:*	Invar "36"
Titanium C-55 or C-70	Alloy B	Invar "42"
Stainless No. 20Cb	Alloy C	HiMu "80"
Carpenter 7Mo (329)	Alloy X	430 Ti
19-9DL	Alloy F	N-155
19-9DX	25 (L-605)	

Wide range of sizes, gauges, lengths, forms and finishes for nuclear requirements

Tubing and pipe sizes available from Carpenter are as follows: *Tubing* from ¼" to 4½" O.D. with 35 BWG (.005") to 9 BWG (.154") walls. *Pipe* of Schedules 5 and 10 in sizes of ⅛" to 4" and Schedule 40 up to 2" IPS. Finishes range from as-welded to high polished. Regular lengths to 45 ft. with longer lengths when specified. Many shapes other than round can be supplied to order.



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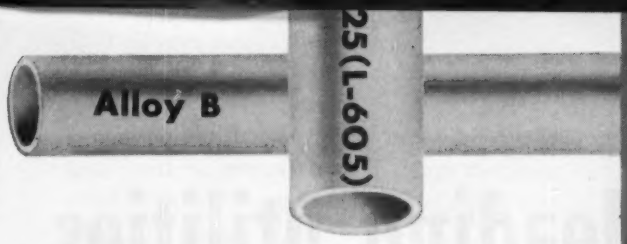
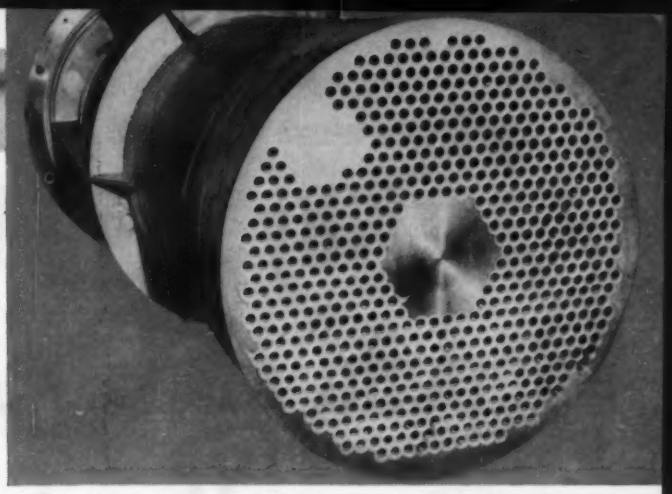
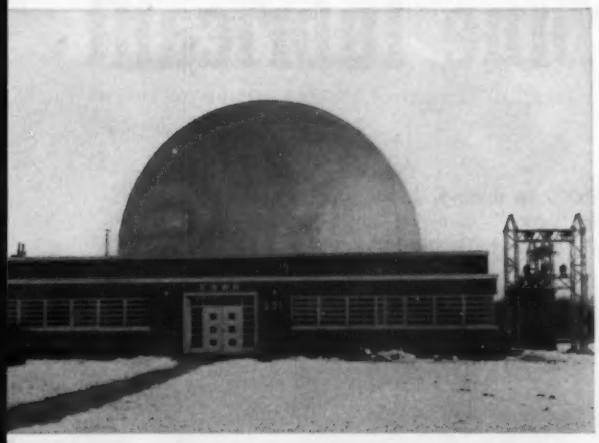


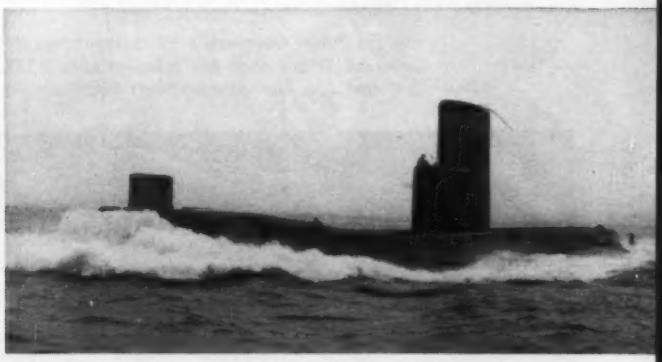
experience Alloy Tubing and Pipe



Carpenter Stainless Tubing is being used in many heat exchangers such as this one for nuclear energy applications. Carpenter quality and ability to meet extremely close dimensional tolerances make Carpenter Tubing ideal for use in heat exchangers.

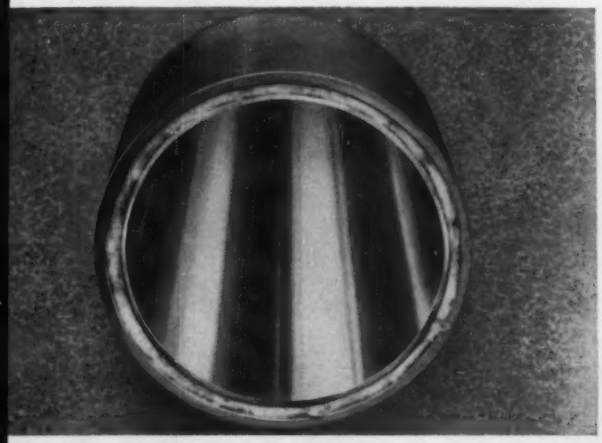


Carpenter has supplied square-shaped tubing for the boiling water reactor in the first nuclear power plant built specifically for electric power generation in the U.S., the 5000-kw experimental plant now in service at Argonne National Laboratory. Illustrated is a front view of the Experimental Boiling Water Reactor. Carpenter also supplied the tubing for the primary heat exchanger for a similar commercial-size plant under construction for a large Mid-West utility.



Photograph courtesy of General Dynamics Corporation

Reprocessing nuclear fuel on the Submarine Intermediate Reactor for the "Seawolf" calls for the use of super corrosion-resistant Carpenter Stainless No. 20Cb in tubing, sheet and plate forms.



Extremely close dimensional tolerances and polish requirements were met by Carpenter in nearly 500 feet of stainless tubing installed in an AEC nuclear power aircraft test facility. Compressed air forces radioactive particles through the tubing, which passes through a 32½ ft. thick concrete wall shielding the reactor. Temperature inside the tubing during operation ranges between 1600° F and 2000° F.

If you are concerned with the design, construction or application of nuclear power equipment requiring tubing and pipe, draw on the broad and extensive atomic experience of Carpenter's technical staff and production facilities. Plan to see our representative soon and send for Bulletin.

MEMBER

The Carpenter Steel Company
Alloy Tube Division, Union, N. J.

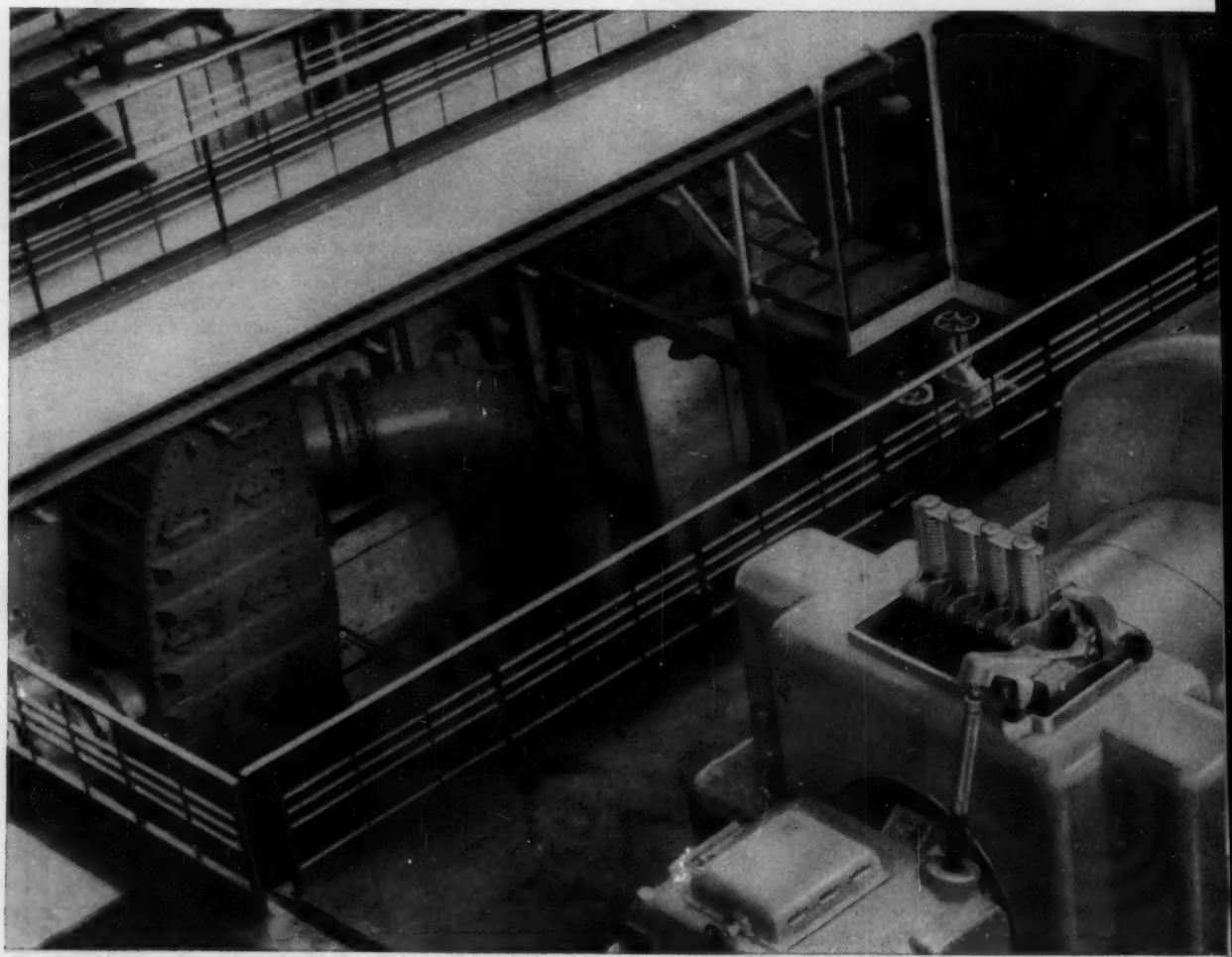
Export Dept.: The Carpenter Steel Co., Port Washington, N. Y.—"CARSTEELCO"

Carpenter

Stainless Tubing & Pipe

Why more leading utilities depend on GULFCREST than on any other turbine lubricant

Georgia Power Company's Yates Plant has three 100,000 kw turbines working—protected by Gulfcrest. They'll soon add a fourth unit, a 125,000 kw turbine . . . and it will be filled with Gulfcrest, too. Each system holds 3,450 gallons of Gulfcrest, finest turbine oil available today!



In Gulf's marketing area, more power is generated by central station steam turbines filled with Gulfcrest than by units using any other lubricant.

Gulfcrest has an outstanding record for protection over the years. In many large turbines Gulfcrest has served continuously for 15 to 20 years with neutralization numbers low, systems free from sludge and rust.

The list of Gulfcrest users reads like a "who's who" of prominent utilities. To find out more about this superb, non-foaming, oxidation-resisting turbine oil ask a Gulf Sales Engineer. Call your nearest Gulf office, or write us for new, illustrated Gulfcrest bulletin, just off the press.

NINE DIFFERENT STEPS, INCLUDING GULF'S EXCLUSIVE ALCHLOR PROCESS, TO PRODUCE GULFCREST!

Gulf, as one of the largest crude oil producers, can select the finest crudes as base oil.

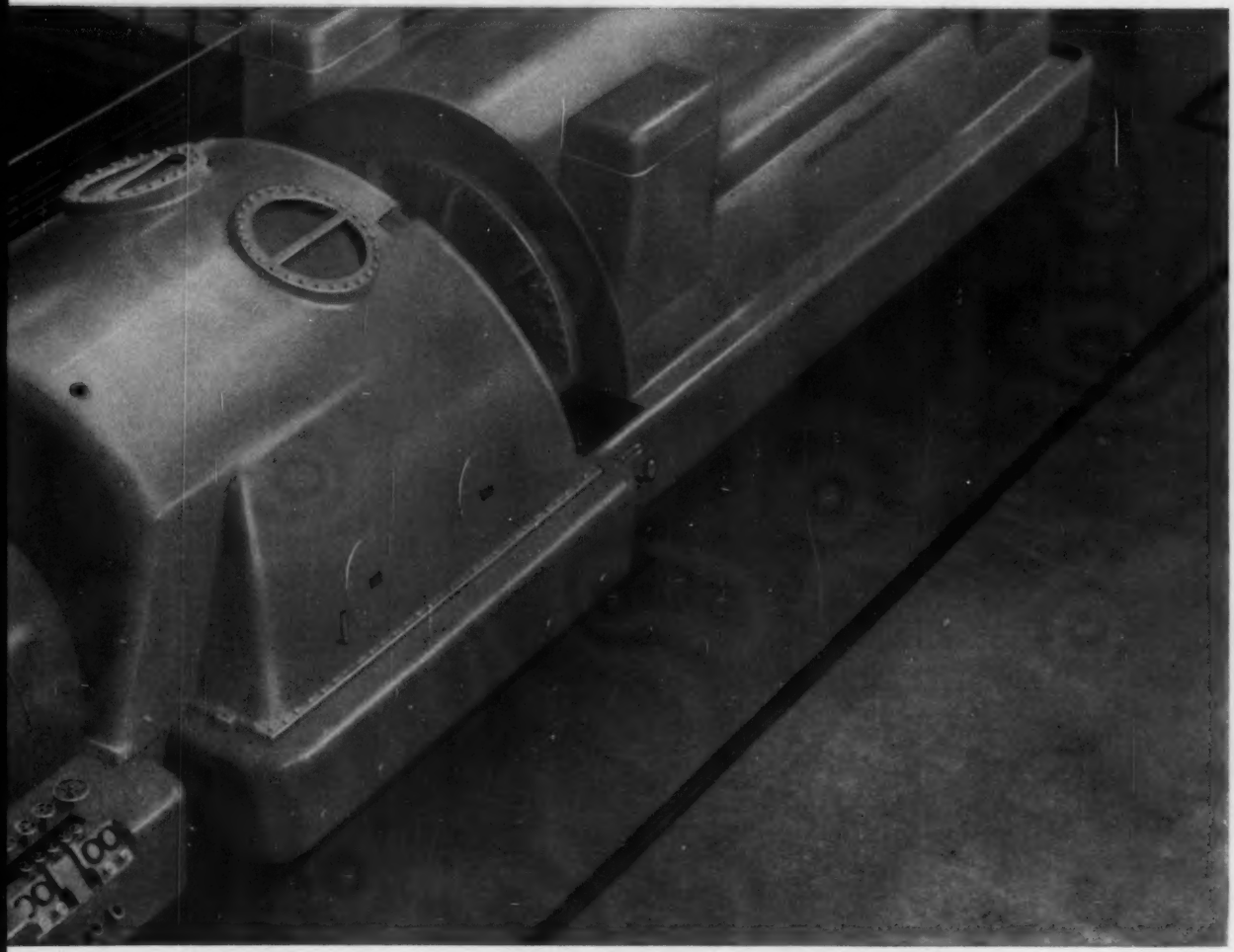
The base oil is first distilled, then put through propane de-asphalting, refined with phenol, dewaxed, fractionated, *super-refined by the Alchlor Process,* processed by clay contacting and filtered.

Only then is it ready for proper additives . . . and Gulf leads in the development of more effective turbine oil additives!

GULF OIL CORPORATION
1822 Gulf Building
Pittsburgh 30, Pa.

GULF

THE FINEST PETROLEUM PRODUCTS FOR ALL YOUR NEEDS



No question of responsibility with

Lapp INDOOR SWITCH AND BUS SUPPORTS

Lapp BACK-CONNECTED BUSHINGS

RATING, Kv		2.5	5	7.5	15L	15H	23	34.5
1.5 x 40 withstand, Kv		45	60	75	95	110	150	200
60 ~ withstand, Kv		15	19	26	36	50	60	80
CLASS A	A-10	X	X	X				
	A-20		X	X	X	X		
	A-30		X	X	X	X	X	
CLASS B	B-20		X	X	X	X		
	B-30			X	X	X	X	X
	B-40			X	X	X	X	X
	B-50			X	X	X	X	X
CLASS D	D-20			X	X	X		
	D-30			X	X	X	X	X
	D-40			X	X	X	X	X
	D-50			X	X	X	X	X

Throughout the range of NEMA standards (SG6-6.06) . . . in three design types, in five strength groups, and in voltage ratings 2500 to 34,500 . . . Lapp Indoor Bus Supports and Lapp Back-Connected Switch Bushings are *matching* series. They match in heights, diameters, strengths, and electrical characteristics.

But, in specifying Lapp bus supports and back-connected bushings, you gain more than the convenience and economy of interchangeability. Yours also is the assurance of single responsibility for performance of porcelain, metal parts and complete insulator assembly. And Lapp responsibility always means an extra margin of operating security, low upkeep and long life.

Available as standard or on specification from all leading switch manufacturers.

◀ Lapp Indoor Switch and Bus Supports and Lapp Back-connected Bushings are available as catalog items in matching voltage ratings, strength groups and design classes as indicated at left.

Lapp Insulator Co., Inc., Le Roy, N. Y.

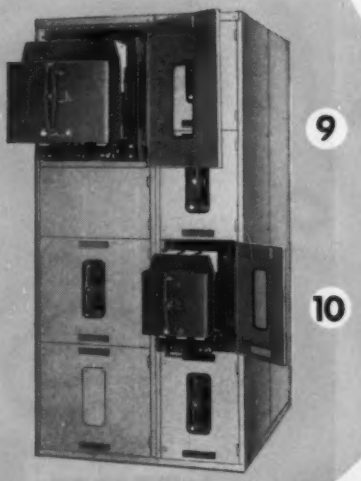
Lapp

MATCHED INSTALLATIONS WITH SQUARE D *POWER-STYLE* LOW VOLTAGE SWITCHGEAR!

Control Centers, Unit Substations or Switchboards—
They All Match! They're POWER-STYLE Construction, Too!

DESIGN LEADERSHIP FEATURES

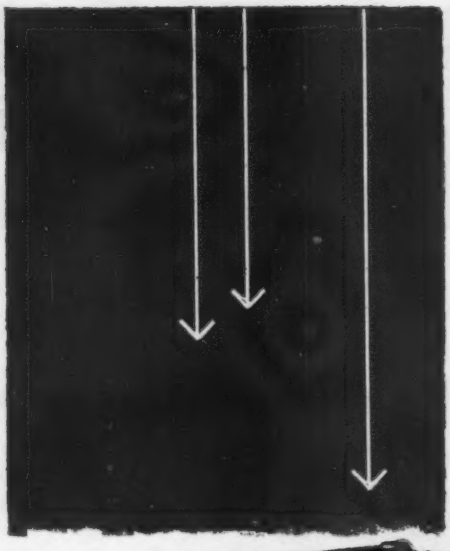
1. New design Type LA circuit breakers with T type handle for easier manual operation
2. Hinged doors provide ready access to circuit breakers
3. Fully equipped compartment for future breaker
4. Four 225 ampere LA-15 or 600 ampere LA-25 circuit breakers can be mounted in an 18″ wide vertical section
5. Three 1600 ampere LA-50 circuit breakers can be mounted in one 26″ wide vertical section. Wider sections are available for higher capacity breakers—34″ for 3000 ampere and 40″ for 4000 ampere
6. Enclosure is 91-½″ high and 54″ deep. Durable, baked enamel blue-gray finish over rust-inhibiting primer
7. Instruments and meters on hinged door of isolated compartment



8. Circuit breakers are mounted on positive pantograph drawout mechanism which holds breaker in *connected, test, disconnected,* or *fully projected* position
9. Bussing is silver plated and braced for 50,000 ampere minimum. Arranged to provide adequate space for cables
10. Pantograph drawout mechanism projects breaker beyond front of switchgear—permits easy inspection of disconnect contacts without breaker removal. When desired, breaker can easily be lifted from pantograph mechanism

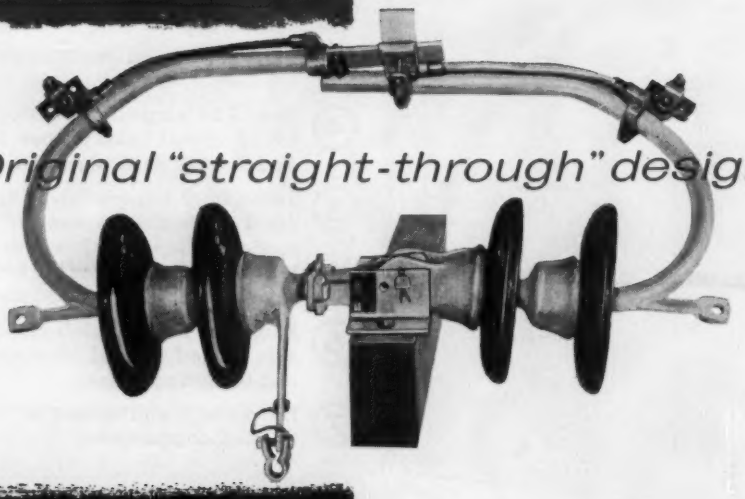
EC&M HEAVY INDUSTRY ELECTRICAL EQUIPMENT...NOW A PART OF THE SQUARE D LINE

SQUARE D COMPANY

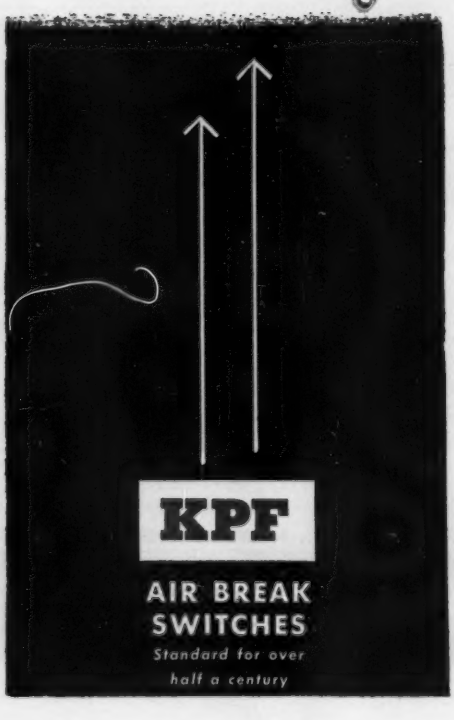


Only KPF switches look like this

simple, attractive, trouble-free, proved in 50 years service



..... Original "straight-through" design .....



You always know when a power company is using KPF switches. (As more and more are today). You can't miss the clean, functional "straight-through" appearance of KPF phase units. This same design simplicity that produces pleasing pole top appearance also insures all-weather operating ease. KPF switches have no temperamental mechanisms to malfunction, freeze, lock, need lubrication or wear out.

KPF switches have proved their dependability in over 50 years service on major utilities. Make a test installation of the original, "straight-through" air break switch on your system this month.

Write direct for catalog.

KPF ELECTRIC COMPANY
Dept. E. 1624 E. Alpine Avenue
Stockton 5, California

4204

Tough coverings on Anaconda Heavy Line Wire help solve your primary problem

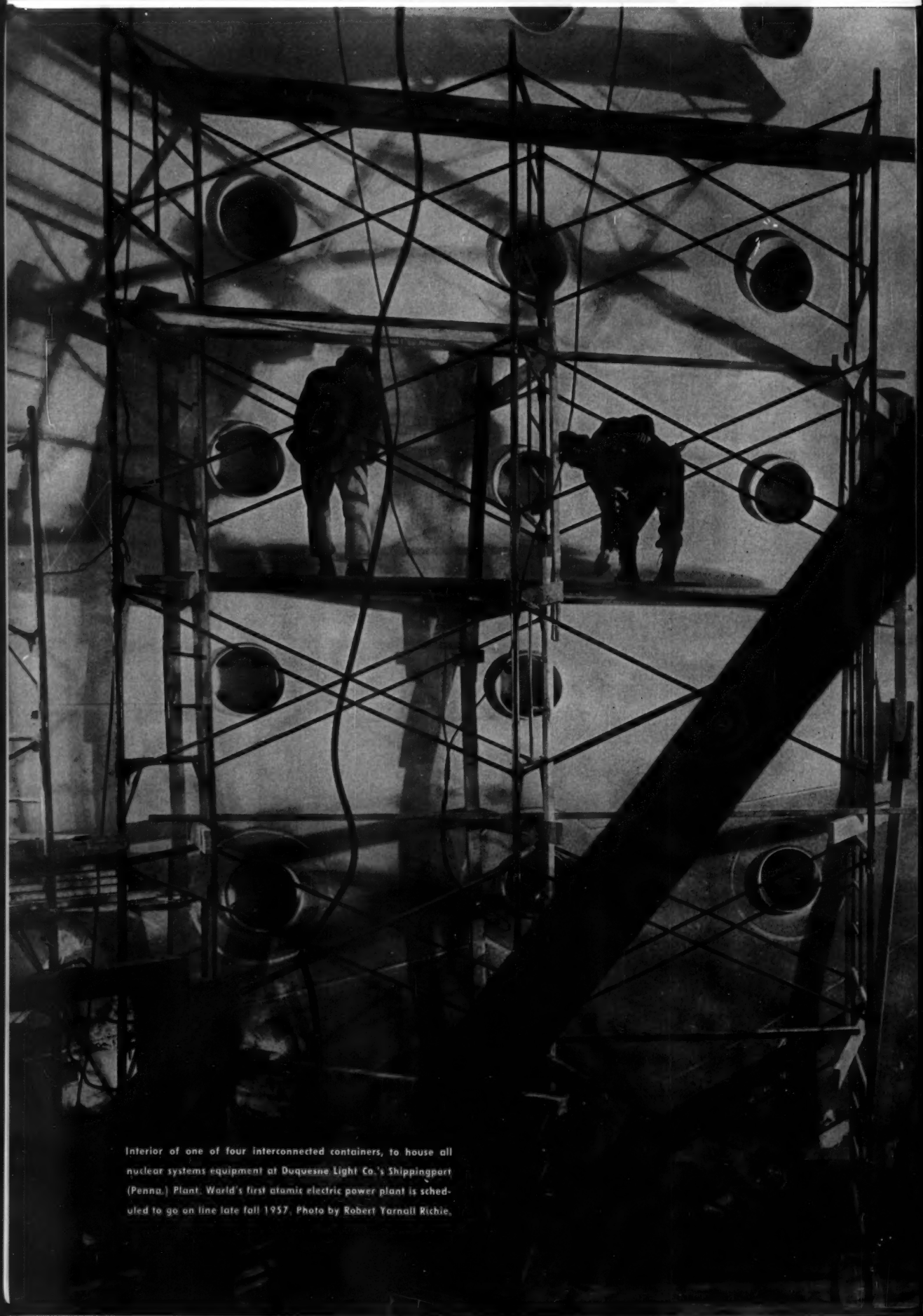
ANACONDA Heavy Line Wire has been designed to solve your primary distribution problems—with today's higher voltages in mind.

It's made with a tough thermoplastic covering. This covering has high resistance to moisture, weathering and abrasion. It protects conductors from contact with wet and broken limbs—from damage caused by wind, rain, sleet and snow. There's greater freedom from faults, less pruning needed. You save money . . . improve public relations.

Covering consists either of rugged polyethylene or time-tested Anaconda Densheath* vinyl resin compound. Conductors are being supplied in copper, aluminum, and ACSR.

NEW BULLETIN DM-5705 contains full information, including sizes, diameters, etc., plus special sag and tension charts. See your distributor or the Man from Anaconda for free copy. Or write: Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y. *Reg. U. S. Pat. Off. 57418

SEE THE MAN FROM **ANACONDA®**
FOR HEAVY LINE WIRE



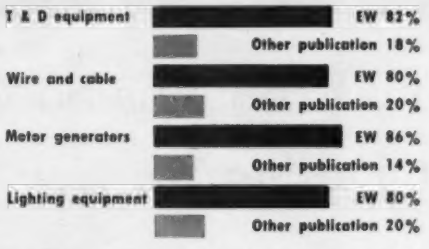
Interior of one of four interconnected containers, to house all nuclear systems equipment at Duquesne Light Co.'s Shippingport (Penna.) Plant. World's first atomic electric power plant is scheduled to go on line late fall 1957. Photo by Robert Yarnall Richie.

In the electric power industry . . .

Is your product in the "big picture"?

You're gunning for a better place in the Electric Power Industry "big picture" for 1957 — planning substantial increases in product recognition, acceptance, sales — a bigger share of that $4.8 billion to be spent for industry expansion. With a bang-up new space campaign you're loaded for bear! You're going to blow some large, profitable holes in the Industry market — or are you?

Aiming a program at "a market" is no more accurate than sighting in on Bucks County to hit a deer. Burn up enough ammo and you may get a hit, but it's no way to keep your sales department well nourished. For we both know that you don't *sell* to a market, you sell to *people* — and your advertising doesn't *talk* to a market, it talks to *readers*. Now, if your problem is getting readers in the Electric Power Industry, why not consider a solution other ad managers have used successfully. The following reader preference scores from questionnaire mailings to their own customer/prospect lists, were developed by manufacturers of...



Your Electrical World District Manager will be glad to discuss any of these studies with you — or to help you plan your own.

. . . and we submit that you're a lot more likely to find *your* customer or prospect reading the publication he prefers.

In conclusion, if you just like to hear the advertising gun go off, how often you miss won't bother you. But if it's *the reader* you're after — if it's *the real meat of the market you're hunting*, your best weapon is still

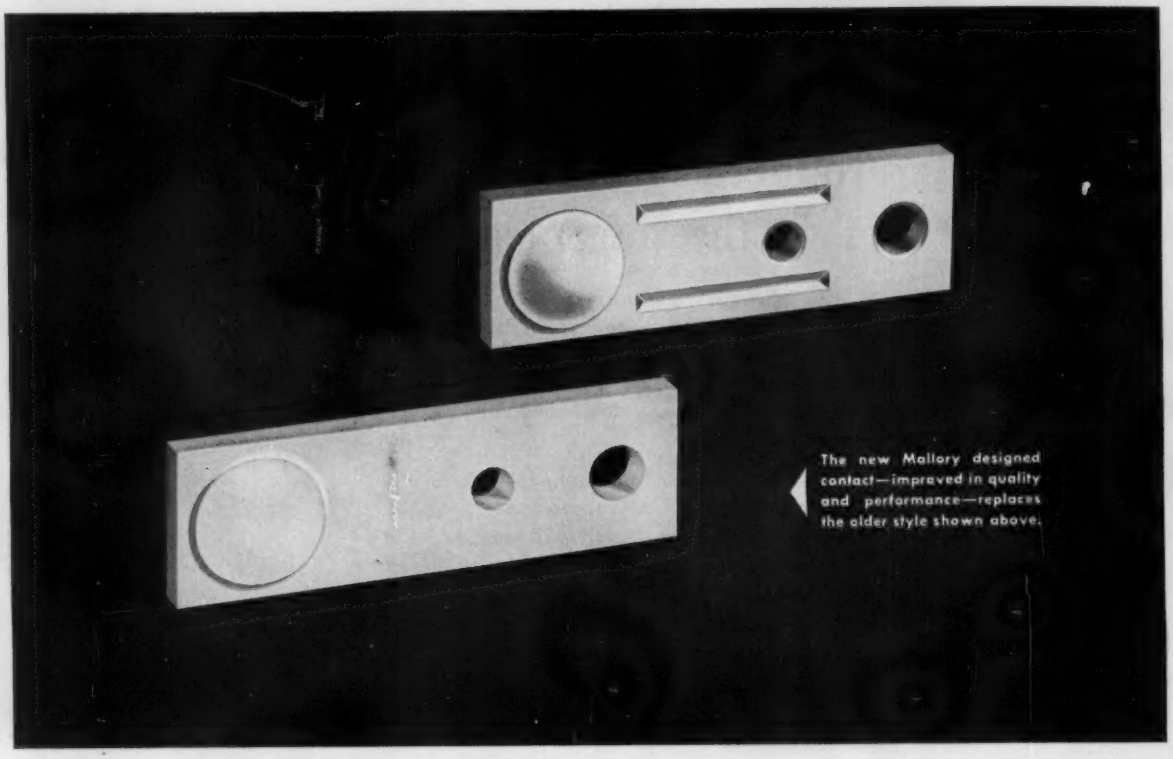
"The Electrical Industry's Weekly Magazine"

"The Electrical Industry's Weekly Magazine"

Electrical World

A McGraw-Hill Publication 330 West 42nd Street, New York 36, New York

ABP ABC



Production and Delivery Problems Solved by Mallory Contact Design Service

A major electrical equipment manufacturer required heavy duty contact assemblies made to rigid specifications. The original design called for hard drawn copper. To retain the hardness, contacts were brazed with a quick shot of heat—on a resistance welder. The silver solder frequently balled up, requiring hollow milling to remove surplus. Deliveries were often delayed—rejects ran high.

Mallory Contact Design Service proposed an alternate design. By switching to Mallory 3 metal, brazing was made easier. The use of Mallory 3 eliminated a hardening operation and enabled holes to be punched instead of drilled. Measured hardness at critical points is now guaranteed.

The customer benefited—almost no production problems, rejections were eliminated, delivery schedules could be met. Field life of the contacts within the finished equipment was greatly improved. Thanks to Mallory Contact Engineering Service, another customer got a better component, better service and a better product at no increase in cost.

FIVE MALLORY KEYS TO ECONOMY THROUGH CONTACT ENGINEERING

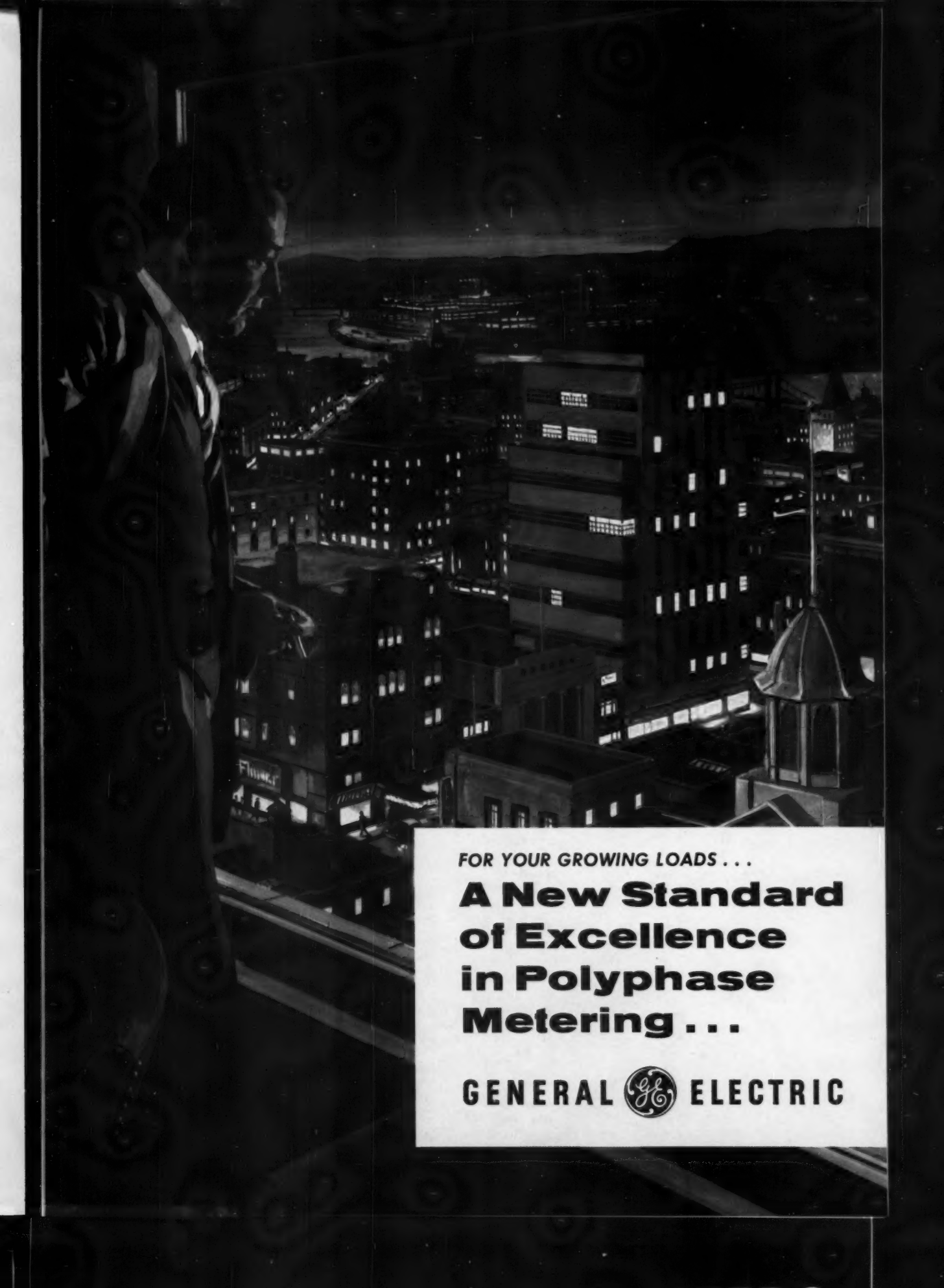
1. The most effective contact material from the extensive line developed by Mallory. More economical alloys often can satisfy *actual* service conditions.
2. The most economical contact design . . . for your purchasing, production and product needs.
3. The most economical backing material . . . from a group of Mallory alloys developed for this use.
4. The most economical backing member design in relation to contact and product design requirements.
5. The most economical method of assembling contact and backing member.

By coordinating *all* these important elements of contact design, Mallory can help you put into effect a long-range plan for cutting contact cost and assuring peak performance.

Serving Industry with These Products:

Electromechanical — Resistors • Switches • Tuning Devices • Vibrators
Electrochemical — Capacitors • Mercury and Zinc-Carbon Batteries
Metallurgical — Contacts • Special Metals • Welding Materials

P. R. MALLORY & CO. Inc.
MALLORY
P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA


FOR YOUR GROWING LOADS . . .
A New Standard of Excellence in Polyphase Metering . . .
GENERAL ELECTRIC

NOW FROM GENERAL ELECTRIC

V-60 POLYPHASE METERS

by GENERAL ELECTRIC give you all the advantages of magnetic suspension plus extended range

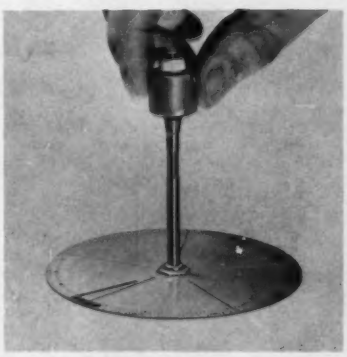
Now for fast-growing polyphase loads everywhere, General Electric's New V-60 Polyphase Meter Family with magnetic suspension gives you greater sustained accuracy, eliminates bearing replacement, helps reduce installation costs and offers you extended current and potential range in just five different meters

YOU GET FLEXIBILITY in metering your various polyphase loads with just five different meters. The new General Electric V-60 family of polyphase meters includes the V-62 network meter, V-63 (3-wire, 3-phase), V-65 (4-wire, Y, 3-phase), V-66 (4-wire, △, 3-phase), and V-68 (totalizing). The extended range—666 2/3% of nameplate rating—means that any of the V-60 family of meters will stay on the job as your polyphase loads climb, whether the loads are residential, commercial, industrial, or special loads such as air conditioning.

YOU GET GREATER SUSTAINED ACCURACY in the new V-60 meters because *magnetic suspension* avoids losses in registration caused by bearing wear. In the V-60 meters, you get the advantages of sustained accuracy which were time-proved in the more than 8 million I-50 series of single-phase meters in service today.

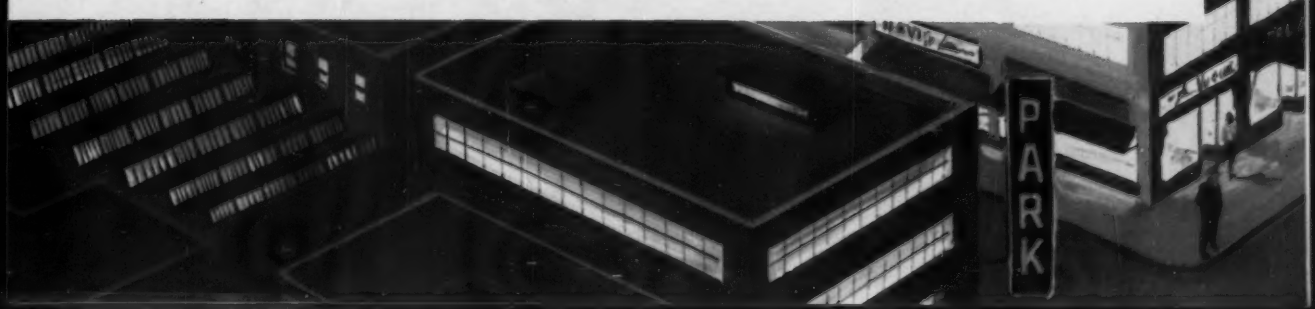
YOU DON'T HAVE TO REPLACE BEARINGS in the V-60 meters because with the *magnetic suspension* system there are no bearings! General Electric *magnetic suspension* cannot wear out . . . even after the equivalent of 300 years on accelerated life tests. With ever increasing polyphase loads, bearings in conventional meters become worn in a few years. With the new V-60 meters, you can lower metering costs by eliminating bearing replacement, due to bearing wobble and inaccurate performance.

YOU CAN SAVE TIME AND MONEY in installing and leveling meters because with the new V-60 family, meter tilt is a negligible factor. Any ordinary meter operating at even a slight tilt will give inaccurate readings and will result in substantial revenue losses. Lab tests prove that G-E meters with *magnetic suspension* practically eliminate revenue losses due to tilt.



For more information on the new V-60 family of polyphase meters, or on any of the complete G-E line of meter products, contact your nearest G-E representative or Apparatus Sales Office, or write General Electric Company, Section 623-1, Schenectady 5, N. Y.

GENERAL ELECTRIC



NOW FROM GENERAL ELECTRIC...

Get Accurate Metering of Heavy Residential Loads with the New V-62 Meter

New General Electric Polyphase Network Meter, first of the new G-E V-60 family of polyphase meters, gives you all the really great advantages of the time-proved I-50 series of single-phase meters.

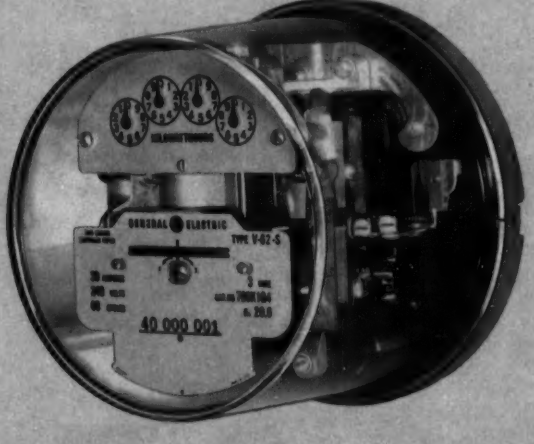
FOR GROWING POLYPHASE LOADS of both today and tomorrow, the all-new V-62 meter with *magnetic suspension* is available in both Class 100 and 200 ratings in either socket or bottom-connected types. In addition, this new network meter can be used in your 3-wire, 3-phase applications.

MAGNETIC SUSPENSION in the V-62 gives you the real advantages of greater sustained accuracy and no bearing replacement. You can lower your installation costs by spending less time and money on troublesome leveling of meters, since meters with *magnetic suspension* are less affected by tilt.

EXTENDED RANGE of the V-62 allows loads up to 666 2/3% of rated current to be metered without the need for current transformers. This means that meter replacement is unnecessary as polyphase network loads grow — whether the loads are residential or commercial.

MAXIMUM SURGE PROTECTION comes from coordination of surge-relief gaps and butyl-molded coil insulation. The revolutionary new gap system in the V-62 provides outstanding surge-current relief and helps avoid lightning damage and costly meter burn-outs.

ADDITIONAL FEATURES of the new V-62 network meter are ease of assembly and disassembly, excellent calibration stability, high corrosion resistance, interchangeability of registers with present meters, outstanding single-stator performance, and improved nameplate visibility.



GET ALL THE DETAILS OF THE NEW V-62 METER BY CONTACTING YOUR G-E REPRESENTATIVE OR APPARATUS SALES OFFICE, OR BY WRITING SECTION 623-1, GENERAL ELECTRIC COMPANY, SCHENECTADY 5, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

US RUBBER CONVEYOR BELTING

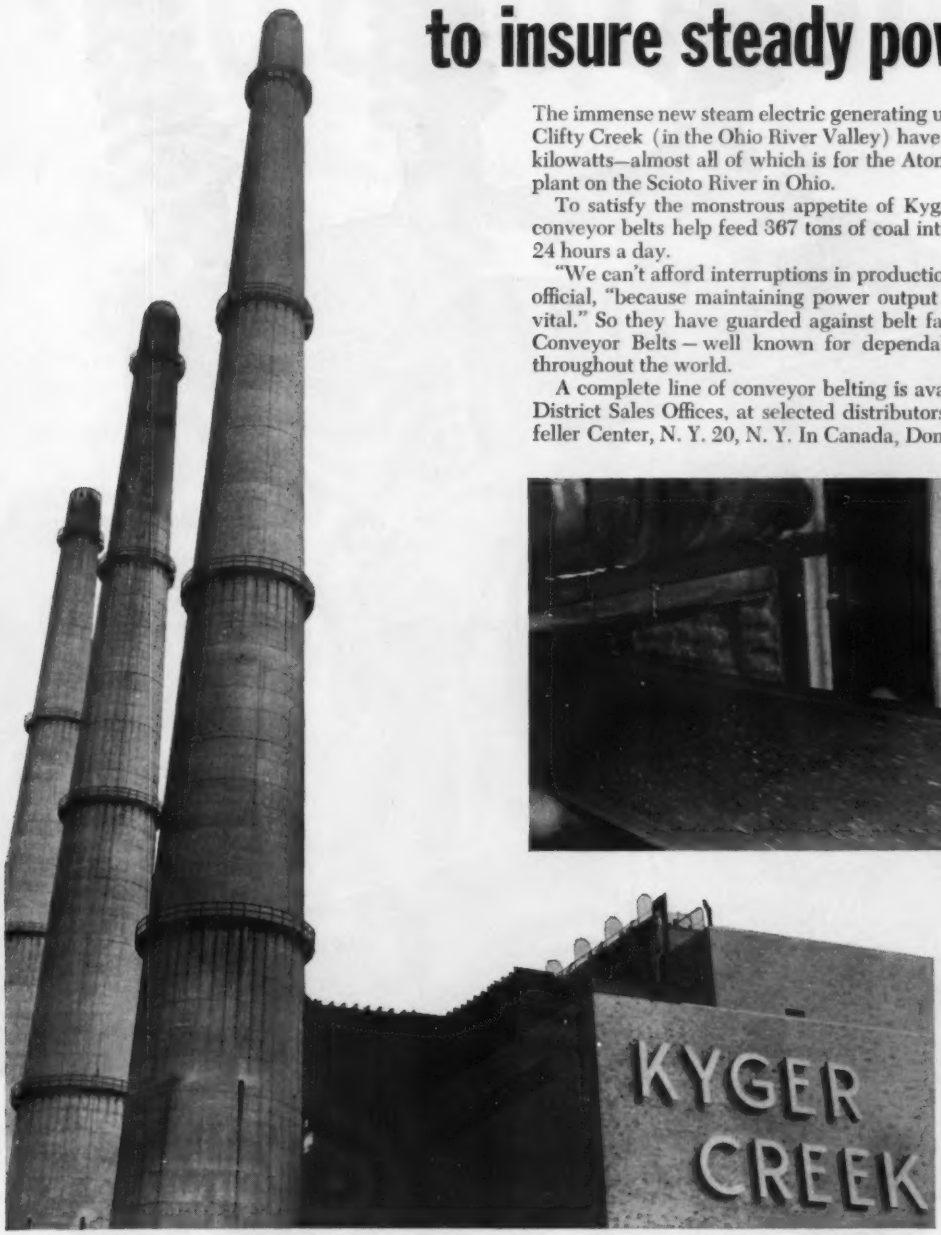
Delivering 367 Tons of Coal per Hour... to insure steady power flow

The immense new steam electric generating units at Kyger Creek and Clifty Creek (in the Ohio River Valley) have a capacity of 2,365,000 kilowatts—almost all of which is for the Atomic Energy Commission plant on the Scioto River in Ohio.

To satisfy the monstrous appetite of Kyger Creek, U. S. Rubber conveyor belts help feed 367 tons of coal into its boilers every hour, 24 hours a day.

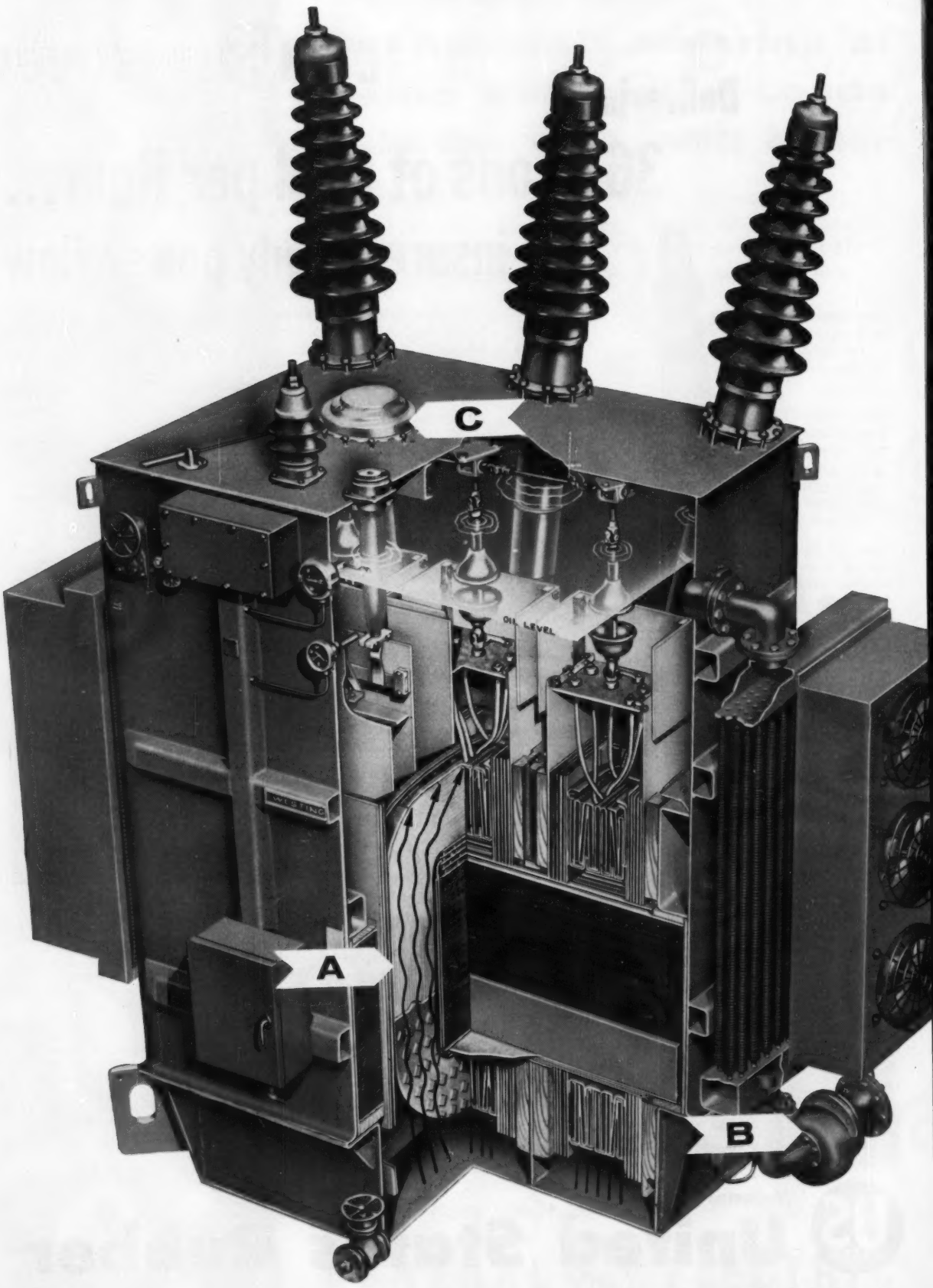
"We can't afford interruptions in production," says a ranking plant official, "because maintaining power output for the atomic plant is vital." So they have guarded against belt failure by selecting U. S. Conveyor Belts – well known for dependability by power plants throughout the world.

A complete line of conveyor belting is available at the 28 "U. S." District Sales Offices, at selected distributors, or write us at Rockefeller Center, N. Y. 20, N. Y. In Canada, Dominion Rubber Co., Ltd.



(above)
The Number One conveyor belt emerging from the unloader hopper at Kyger Creek. This 48" wide U. S. Matchless® belt provides excellent troughability, extreme rip resistance, fine training and long life. This excellent conveyor system and belting mean considerable savings in manpower to move the coal supply.

US RUBBER Mechanical Goods Division **United States Rubber**


C
OIL LEVEL
A
B

How Westinghouse safely* saved the electric utility industry $100,000,000!

Today, over 80 million kva of Westinghouse forced-oil-cooled transformers are delivering superior performance

In 1922, Westinghouse pioneered forced-oil cooling for power transformers. Since then, its inherent economies have saved electric utilities over $100,000,000. Here's why *you* get more transformer per dollar with Westinghouse . . .

A—*SUPERIOR COOLING ARRANGEMENT*

Form-Fit® design directs oil circulation to *all* parts of the winding. No special ducts or baffles. Rectangular-shaped coils placed vertically in the tank form long, vertical oil ducts. Oil is in direct contact with both sides of each coil. Hot-spot temperatures are reduced, service life extended and overload capacity increased.

B—*LOW-PRESSURE, HIGH-VOLUME OIL FLOW PROVIDED BY PUMPS*

Extremely low pressure and temperature differentials in the Westinghouse system of forced-oil cooling result in increased transformer life. The many parallel vertical ducts in the winding and cooler have exceptionally low-pressure drop even when large volume of oil is circulated by the low-head centrifugal pumps. With high-volume forced-oil cooling the difference between top and bottom oil temperature is held to a minimum with resultant low hot-spot temperatures.

C—*POSITIVE OIL PRESERVATION*

A completely sealed, inert gas system is recommended to keep moisture and atmospheric oxygen out and keep oil clean indefinitely. Maintenance costs are kept down—way down.

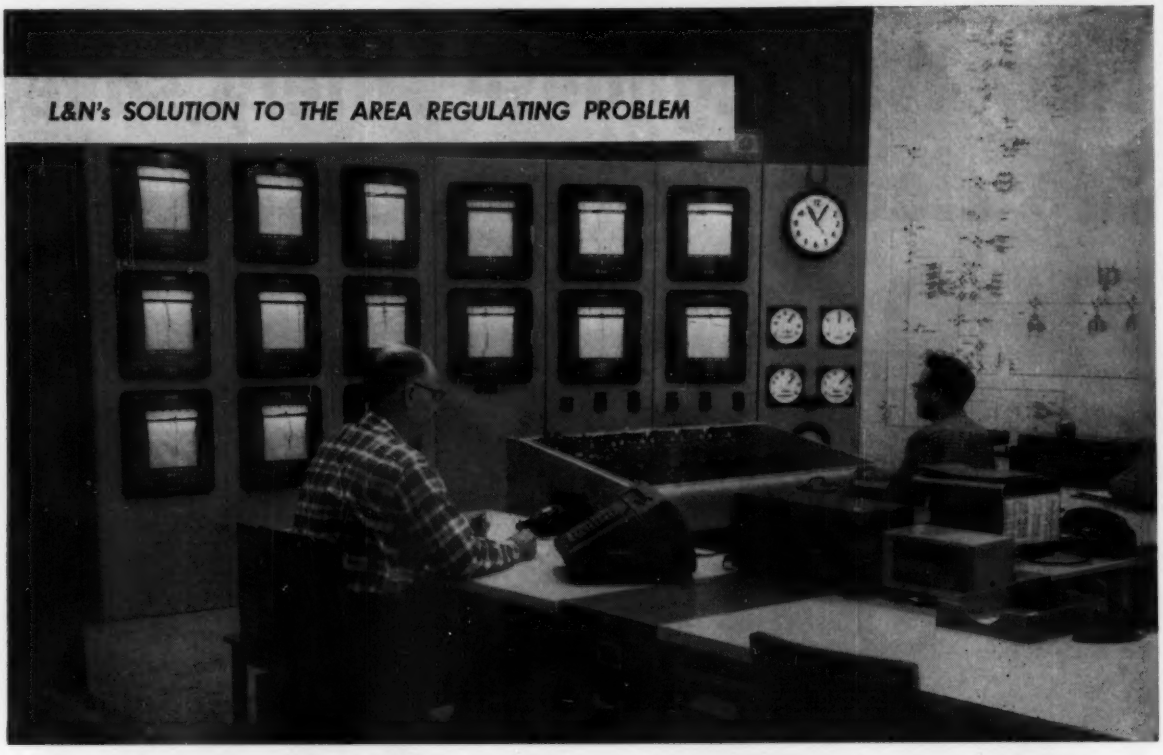
*Two proved gas systems are available—Inertaire® which maintains positive pressure at all times and Sealedaire†; both are sealed for complete protection.

For the full story of how Westinghouse power transformers with forced-oil cooling can save you money—in longer service life, lower maintenance and extra overload capacity—call your Westinghouse representative. Or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70816

†Trade-Mark

YOU CAN BE SURE...IF IT'S

Westinghouse



Victoria Control Center gears Central Power & Light Co. System to lowest-cost operation. Their new . . .

Flexible area load control makes generation changes automatically—even under adverse operating conditions

Written by J. R. Burdine, Engineer, Leeds & Northrup Co. for this advertisement

• Because they were aiming at the best overall system Btu/kwhr, CP&L engineers installed this dispatching center which brings computing circuitry to bear on their system operating problem on a round-the-clock basis.

CP&L operations require a control that not only makes lowest incremental cost-of-generation possible during normal load conditions; it also has to be flexible enough to maintain automatic operation during the morning pick-up, and in times of system upsets as well, for this is when operating costs tend to climb.

Operating Experience

The new Area Load Control, made by the Leeds & Northrup Company, has been found to operate smoothly. Generation changes today are gradual—units are no longer whipped to accommodate bloc load changes. Experience during the first year of operation shows that the control enables dispatchers to stay on "automatic" during adverse operating conditions. Better than 85 per cent of the company's generating capacity is under control from this office, assuring ample regulating capability.

Adequate Feedback Essential

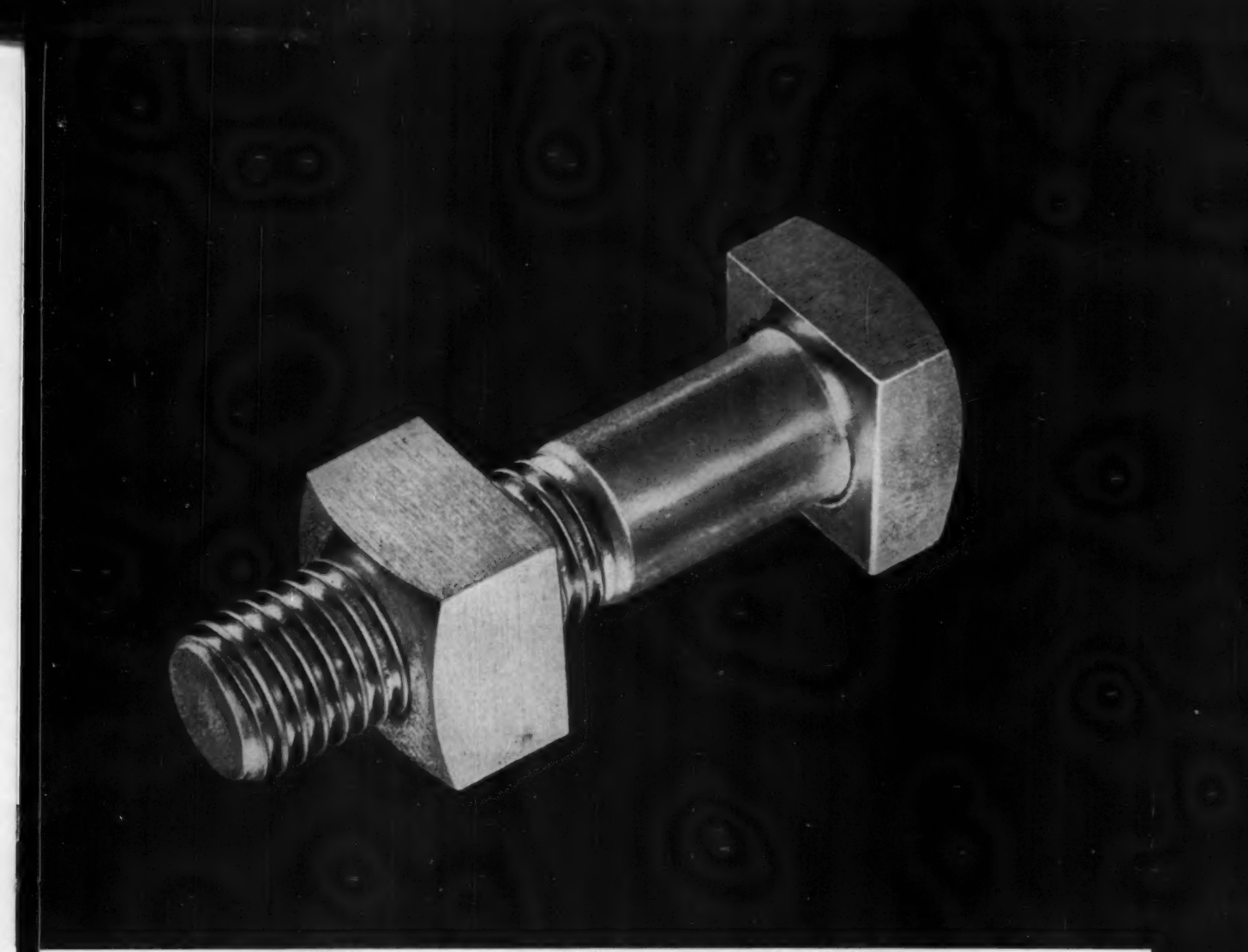
One big reason for better performance is feedback of all pertinent control intelligence including behavior of each unit as it responds to control signals. By keeping all units moving in unison along their respective incremental cost curves, "hunting" among units is eliminated—and with it the unnecessary generation changes which would occur if units were to respond to anything other than the basic (Area) requirement.

Analysis of CP&L's Problem

Before installing the new control, CP&L had only one plant operating on automatic tie-line control. By 1954, it became evident that much greater regulating capability would be required. At that time, CP&L operating engineers talked with various control manufacturers about a new control that could (1) cope with rapidly-changing requirements (such as changing availabilities of units for control purposes, unscheduled outages, etc.) and (2) provide smooth regulation for a large area.

From the proposals submitted, CP&L chose a combination of standard Leeds & Northrup Area Load Control components. These were in-

Continued on page 136



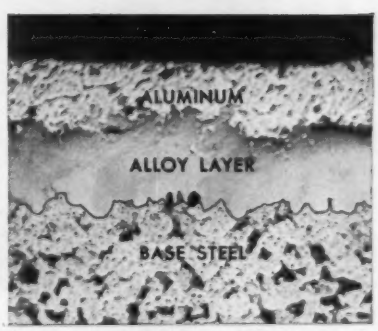
The Bethalume process produces an unusually uniform coating, ensuring clean threads for good fit.

Bethalume Coating Gives Fasteners Better Resistance to Corrosion

Fasteners used in corrosive atmospheres have a much longer service life, and require little or no maintenance, when protected by Bethlehem's Bethalume coating—a hot-dip coating of pure aluminum.

The Bethalume coating is effective in enabling fastener items to withstand the effects of corrosive atmospheres because it adds the permanence of aluminum to the strength of steel. The coating is tightly bonded to the base steel, and is uniform over the entire surface of the fastener. The coated threads are clean and smooth-fitting.

Why not look into the advantages of the Bethalume coating for your fasteners applications? A telephone call to the nearest Bethlehem sales office will bring one of our representatives to your desk promptly.



Photomicrograph of Bethalume coating. Pure aluminum is bonded to base steel by iron-aluminum alloy.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

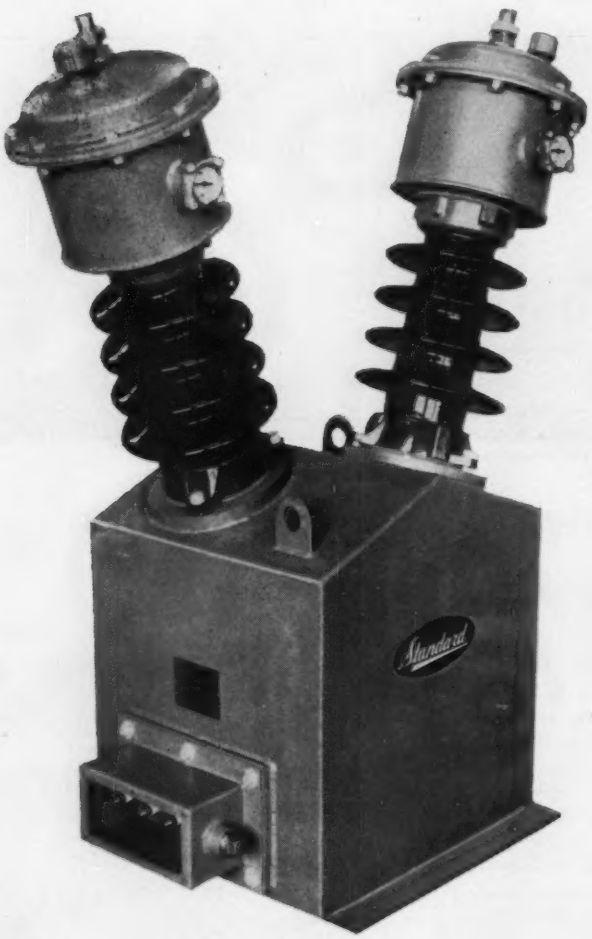
BETHLEHEM STEEL

BETHLEHEM STEEL

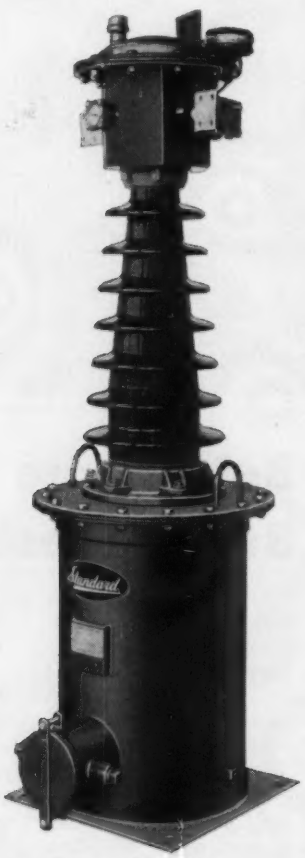
NEW! Standard®

Standard Transformer's new line of completely redesigned outdoor metering transformers gives maximum accuracy on all metering applications. The vacuum impregnating process removes all traces of air from the heated core and assembly, resulting in the highest dielectric strengths. Most models can be mounted in any position.

The new line meets all ASA, EEI, and NEMA mounting and accuracy standards. Transformers are smaller and lighter than ever before. For specifications and certified dimension prints, see your nearby Standard representative or write directly to us. You'll increase your accuracy at the point that counts—ahead of and at the meter!

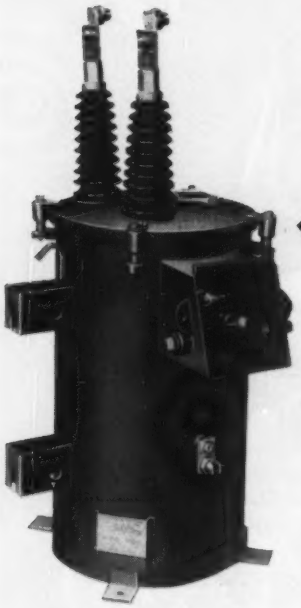


TYPE PXO OISC POTENTIAL TRANSFORMER
— outdoor type. 34,500 volts primary, 120 volts secondary. For platform mounting.



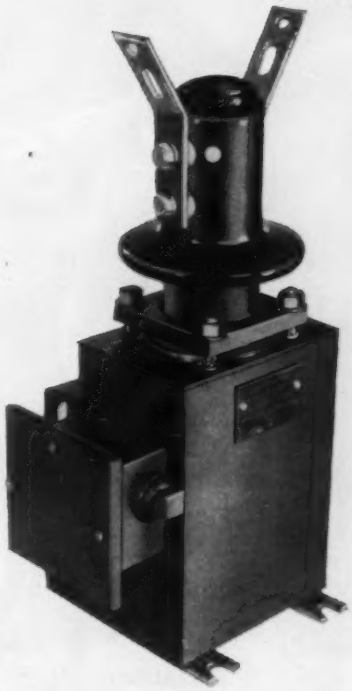
TYPE CXO OISC CURRENT TRANSFORMER
— outdoor type. 72,000 volts, 200/400 to 5 amperes, 350 KV FW impulse level. With oil level indicator, primary bypass protector, and secondary terminal box.

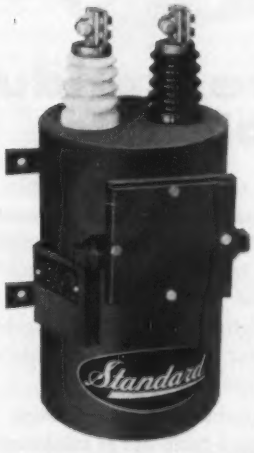
OUTDOOR METERING TRANSFORMERS



TYPE PWO OISC POTENTIAL TRANSFORMER— outdoor, 14,400 to 120 volts, 15 KV insulation class, 110 KV FW impulse level, pole or platform mounting.

TYPE OCO CURRENT TRANSFORMER — outdoor type, compound filled, for high accuracy relaying and metering service. 5 KV to 15 KV insulation class; 60 to 110 KV full wave impulse levels, 10 through 800 amperes.





TYPE PWD POTENTIAL TRANSFORMER — outdoor type. Compound filled. 2400 volts primary. Equipped with brackets for pole or cross-arm mounting. Secondary terminal chamber. Also available at 4800 volt rating, 60 KV impulse level.

TYPE CWD-1 CURRENT TRANSFORMER— outdoor type, compound filled, for 5000 volt service furnished in ratios 10 through 800 amperes.

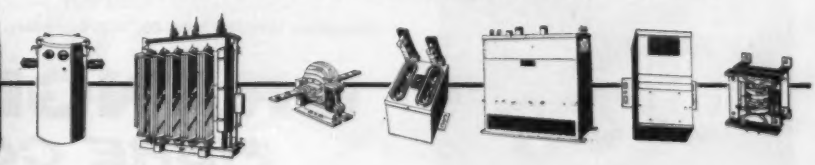
Standard®

THE STANDARD TRANSFORMER COMPANY

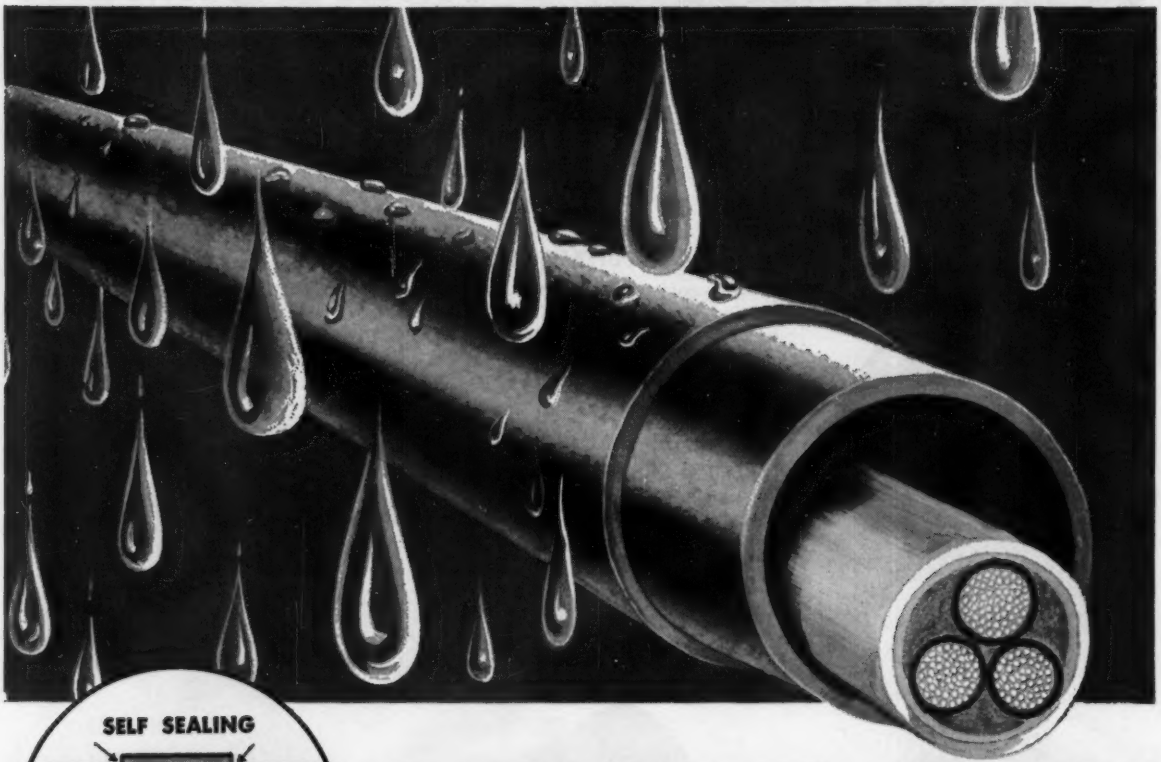
WARREN, OHIO

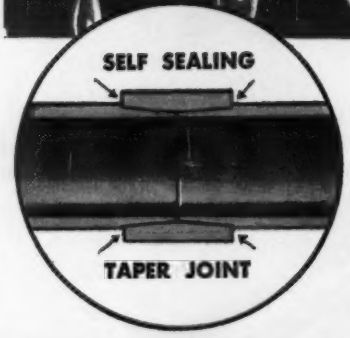
REPRESENTATIVES IN PRINCIPAL CITIES

Transformers FOR EVERY APPLICATION



WATERTIGHT!





Orangeburg Fibre Conduit Prolongs Cable Life

Keep out corrosive ground waters, and you prolong the life of underground cables, say utility engineers!

Why? Because ground waters containing corrosive elements derived from the soil and concrete encasement attack cable sheath and shorten cable life. Orangeburg's impermeable wall and self-sealing Taper-Sleeve Joint shed them *"like water off a duck's back."* You get maximum protection with Orangeburg.

Orangeburg protects cables in many other ways. Smooth bore, low co-efficient of friction reduce incidence of abrasion. Its material is strong, tough, resilient, durable.

No other conduit is easier to install

Light, 8-foot lengths and a complete line of bends and fittings speed installation. Taper-Sleeve Joints tap water-tight in a jiffy. Orangeburg lays faster and at lower cost than any other type of conduit.

Orangeburg Fibre Conduit has prolonged cable life at minimum expense for utilities, municipalities and industry since 1893.

Distributed by Graybar Electric Company and by General Electric Supply Company. Branches and stocks in principal cities.

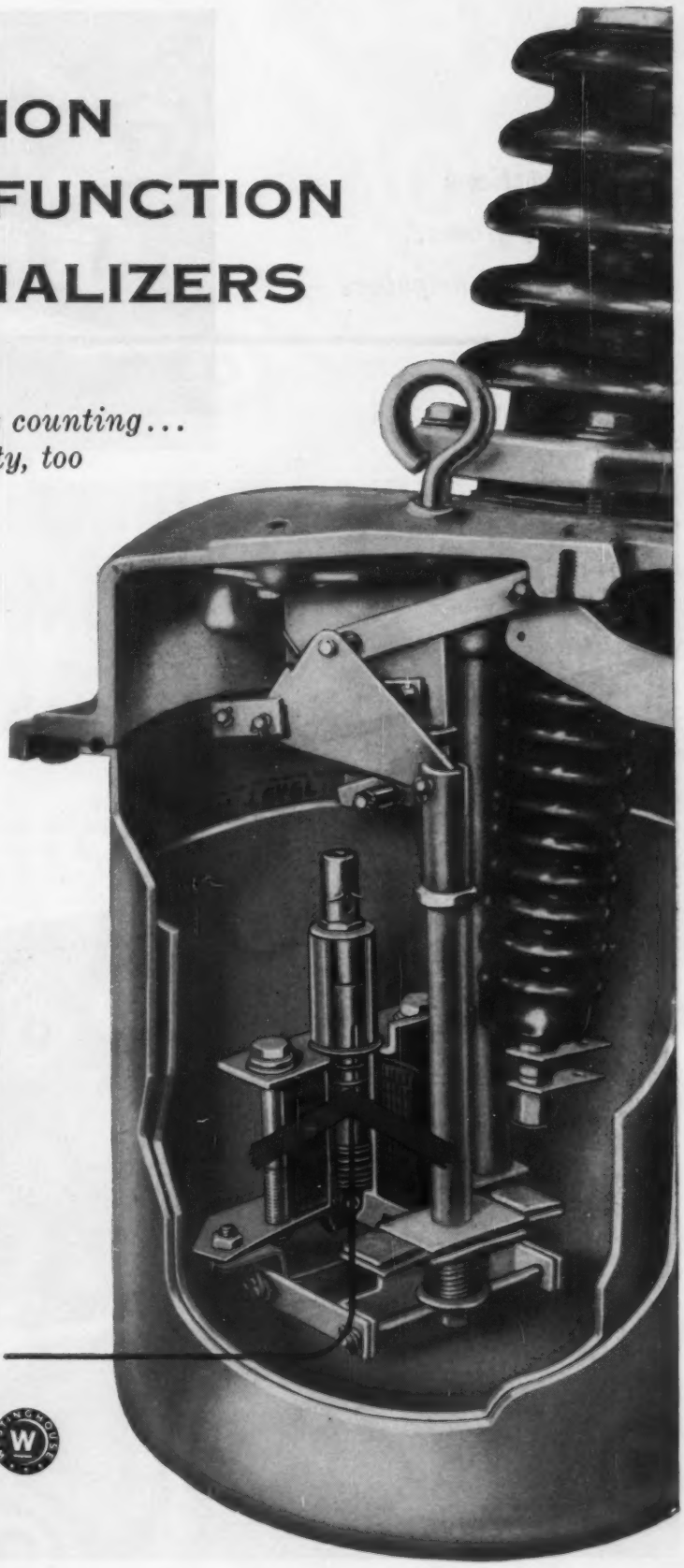
WRITE DEPT. EW-67 FOR CAT. 52

ORANGEBURG MANUFACTURING CO., INC., Orangeburg, N. Y. West Coast Plant, Newark, Calif.

ORANGEBURG®
FIBRE CONDUIT

COORDINATION IS A PRIME FUNCTION OF SECTIONALIZERS

Only Westinghouse gives you absolutely precise counting... and greater current capacity, too



By definition, a sectionalizer is an automatic switch which works in conjunction with power circuit breakers and reclosers to isolate local, permanent faults and thereby protect system service continuity. Its ability to coordinate with breakers and reclosers is therefore a paramount factor in evaluation.

Westinghouse sectionalizer coordination is positive. The Westinghouse sectionalizer will carry more than 50% greater current, continuously, and will accept momentary leads up to 6500 amperes. The Westinghouse Type GRS line is the most complete—nine current steps from 5 through 140 amperes—and voltage ratings to 15 kv.

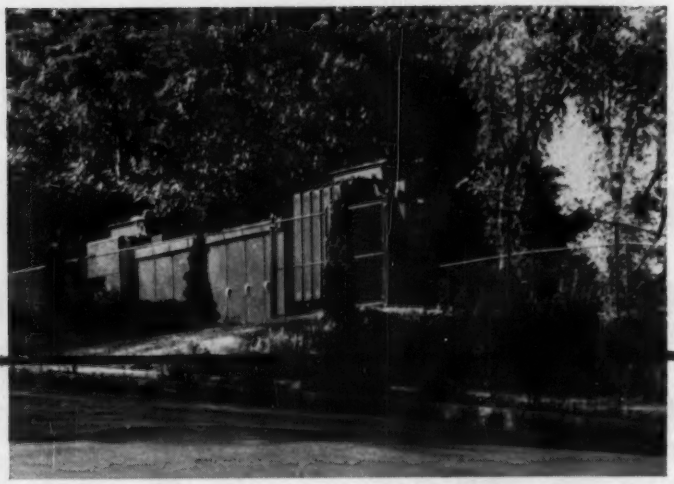
Complete details are available from your Westinghouse sales representative. Also, you may write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania, for reprint No. 5090, an application and engineering AIEE paper on sectionalizer coordination concepts. J-60923

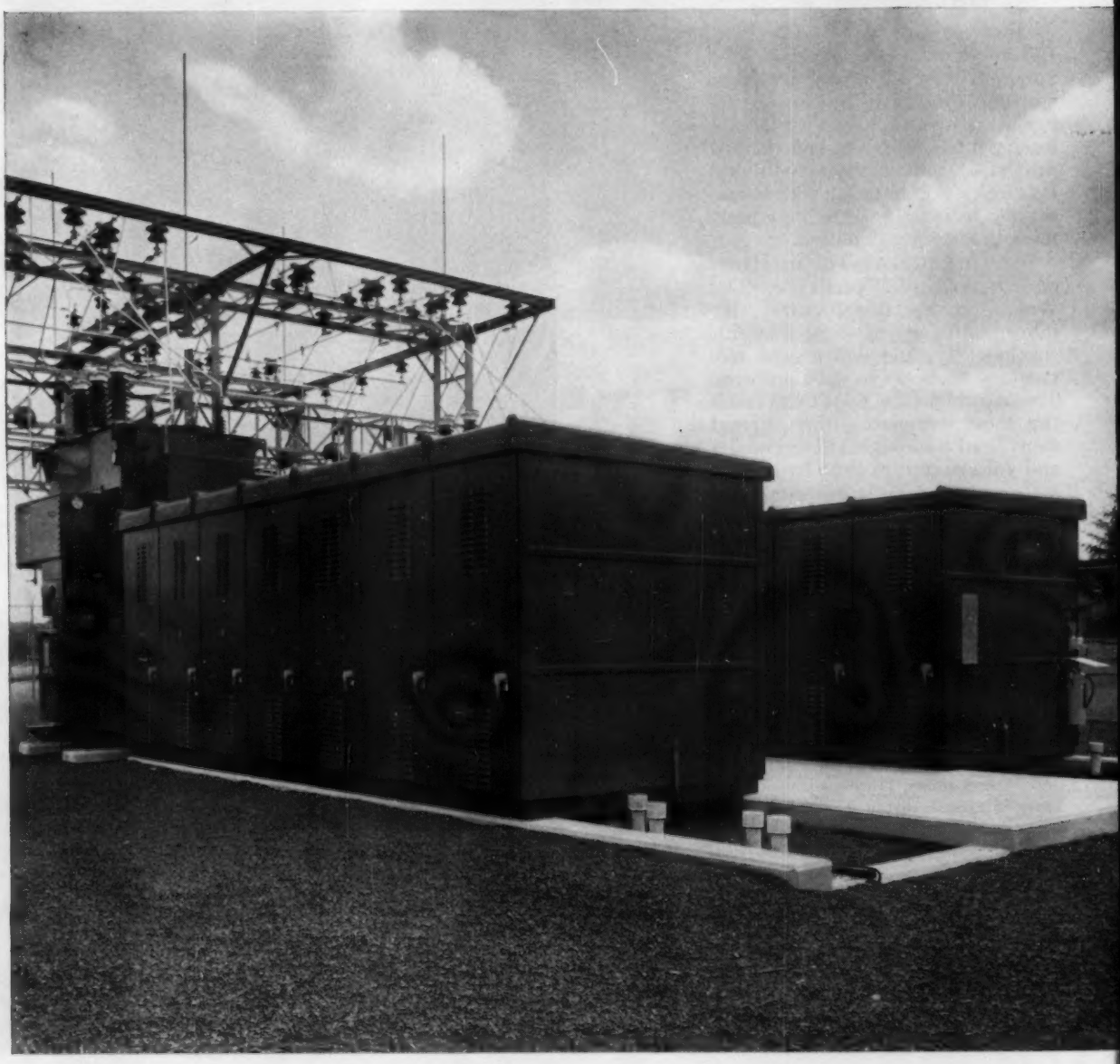
Consistent and accurate counting is assured by the patented magnetic rings in the integrator mechanism. During operation, the brass integrator piston is locked in each counting position by the magnet plate on top of the series coil.

YOU CAN BE SURE...IF IT'S

Westinghouse

Unit substations
designed to grow...
and to be good neighbors





BUILT-IN FLEXIBILITY TO ACCOMMODATE LOAD GROWTH, LOAD SHIFT

Planning for the future—in load growth and load shift—with minimum capital outlay today is a universal distribution problem. Westinghouse anticipated it—designed unit substations that can grow—and be good neighbors in residential areas, too.

For instance:

The box-type throat connection allows simple transformer interchangeability.

Standardized metalclad switchgear makes addition of feeder units economical and visually attractive.

Single-end stations can become double-end with a minimum of installation time and manpower.

Appearance and new low-cost transformer soundproofing make them more acceptable—for less of your money—in thickly populated residential areas.

Moreover, *all* components of Westinghouse unit substations are engineered and coordinated by *one* manufacturer with complete control of design, manufacturing and assembly. Discuss your requirements with your Westinghouse sales representative and learn the full extent of the advantages to be gained. Or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa., requesting DB 34-250 for additional information. J-60914

YOU CAN BE SURE...IF IT'S

Westinghouse

Here's how to save on a rainy day . . .

Work INDOORS on new Westinghouse OUTDOOR switchgear

The weather need no longer disrupt your maintenance schedules. In fact, you can *use* the rainy or snowy days to work on new Westinghouse Shelterfor-M* metalclad switchgear—and save the more pleasant days for regular exposed-to-conditions jobs.

Westinghouse Shelterfor-M metalclad switchgear eliminates for all time the danger of rain or snow damaging breakers, instruments or relays. No more hanging canvas tarps—constructing makeshift shelters. Everything can be done from inside. Heating can be provided to eliminate the difficulty of working on super-chilled bare metal. In short, service is safe and comfortable in all weather conditions.

This new construction allows instrument panels to swing wide enough for front drawout of breakers for inspection and testing. There is room enough to pass two breakers side-by-side in the shelter even with the doors open wide.

In addition, you get the other outstanding Westinghouse features such as . . . jig-welded construction, assuring interchangeability of like-rated breakers. Bonderized and multi-coat painting plus undercoating to eliminate rust and corrosion. Exclusive Redarta® insulation—the flame-retardant insulating material. Ask your Westinghouse sales representative for detailed information and prices, or write to Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa. J-60910

*Shelterfor-M—sheltered for maintenance

YOU CAN BE SURE...IF IT'S Westinghouse

The extensive shelter area permits moving breakers past one another even though the instrument panel is in full extended position.

Connect
COPPER with COPPER
ALUMINUM with ALUMINUM
use...

PAC-5
ACSR 6—1/0 Cu. 8—1/0

PAC-3
ACSR 8—2 Cu. 8—2

PAC-4
(formerly PAC 6—0)
ACSR 6—1/0 Cu. 6—2

PAC-7 (replaces PARC 6—0)
ACSR 1/0—336.4 6—1/0 A/R Cu. 8—1/0

BLACKBURN COPPER TO ALUMINUM FITTINGS

BLACKBURN PAC CLAMPS

ELIMINATE CORROSIVE SOLDERS, VOIDS AND FLUXES !

There are many satisfactory copper connectors for connecting copper conductors.

There are many satisfactory aluminum connectors for connecting aluminum conductors.

Blackburn's PAC clamps combine the features of a good copper connector and a good aluminum connector to give you the best copper to aluminum connector available.

Our exclusive method (Patent applied for) of pressure casting molten corrosion resistant aluminum alloy around specially treated pronged copper liners establishes an intimate, low resistance contact of the two metals without using corrosive solder.

The copper liners, which cannot be mated incorrectly, surround the copper conductor establishing a good copper to copper contact.

The aluminum grooves surround the aluminum conductors, establishing a good aluminum contact.

Adequate contact surface and conductor separation is built into Blackburn's PAC clamps to insure long-lasting, trouble-free copper to aluminum connections without setting up cold flow or galvanic corrosion.

Spring action is inherent in the design of PAC clamps and is supplemented with an extra-heavy spring lockwasher insuring permanently tight connections which will withstand temperature fluctuations.

Hot dipped galvanized steel hardware is standard. Aluminum hardware available on all but Catalog #PAC-3.

AVAILABLE THROUGH ELECTRICAL WHOLESALERS EVERYWHERE

JASPER BLACKBURN CORPORATION

35 MADISON STREET • ST. LOUIS 6, MO. • PHONE: MAin 1-2821

Proven Leadership*

*IN 1956 . . . MORE UTILITIES BOUGHT

POWERS American

SERVICE BODIES

THAN ANY OTHER MAKE

HERE'S WHY! Powers-American builds *fine* service bodies . . . and *builds them to last.*

Powers-American can furnish the *just right* body for any service job—standardized for greatest economy . . . modified-standard, to fit individual job needs . . . custom-made, to meet specific operating requirements.

Whether you have one truck or the largest fleet . . . you'll find it worthwhile to get details from Powers-American next time you need service bodies for your operation.

SERIES 350 Bodies have an under-floor winch, a fold-over derrick, and an extension ladder. Compartments are equipped to carry a variety of service tools, parts, and materials.

SERIES 25 Bodies are available in standard models equipped specifically for telephone, electric, gas, or water meter installation and service.

SERIES 44L Bodies have same construction features as Series 44 Bodies described above . . . plus a shelf-equipped superstructure, available with or without roof.

SERIES 450 Bodies, designed for light duty construction and maintenance work, are equipped with a revolving aerial ladder, an underfloor winch, and an easy-to-use derrick.

Descriptive literature and price information is yours for the asking

SERIES 44 Bodies . . . in 75", 90", and 104" lengths . . . are designed for service work in any phase of the utility industry. Equipped with bins, racks, material hooks, and adjustable shelves. Available with optional items to fit individual work needs.

UTILITIES EXPECT MORE FROM POWERS American

McCABE-POWERS

AUTO BODY COMPANY

5900 NO. BROADWAY • ST. LOUIS 15, MO. 625 CEDAR ST. • BERKELEY 10, CALIF.

SEVEN WONDERS OF THE

. . . developed with the help of the World's Greatest Lubrication Knowledge!

A giant wind tunnel that "flies" jets at supersonic speeds . . . a submarine that runs on nuclear power . . . a machine that makes genuine diamonds. These are some of the scientific wonders pictured on these pages. Each one is *the first of its kind*—designed to add to man's knowledge of the world around him. And each was developed with the help of Socony Mobil's vast lubrication knowledge.

When new machines are being planned . . . when unknown problems of lubrication lie ahead —machine builders and machine operators have found it pays to call on Socony Mobil.

Whatever *your* lubrication problems, large or small, we're ready to help you solve them . . . to improve your production, reduce costs through a program of *Correct Lubrication*.

SOCONY MOBIL

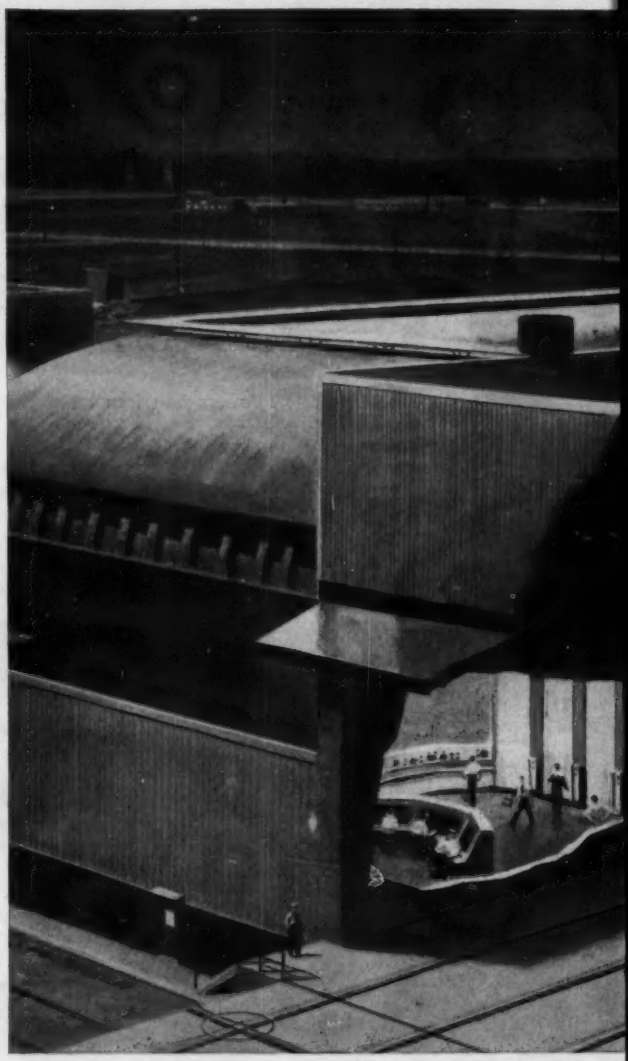
Mobil

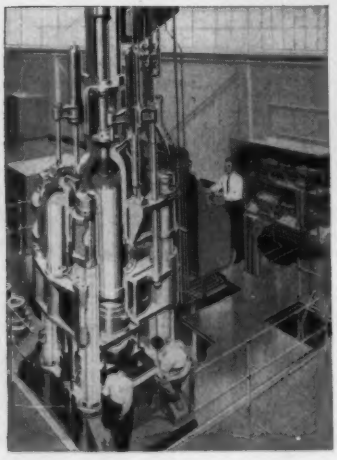
Correct Lubrication

FIRST STEP IN CUTTING COSTS

Leader in Lubrication for 91 Years

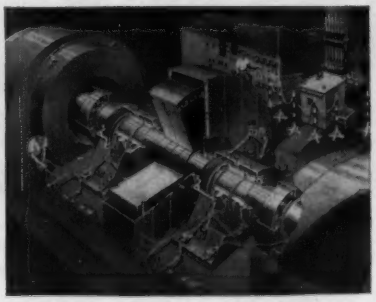
SOCONY MOBIL OIL COMPANY, INC., and Affiliates:
MAGNOLIA PETROLEUM COMPANY, GENERAL PETROLEUM CORPORATION, MOBIL OVERSEAS OIL COMPANY, INC.





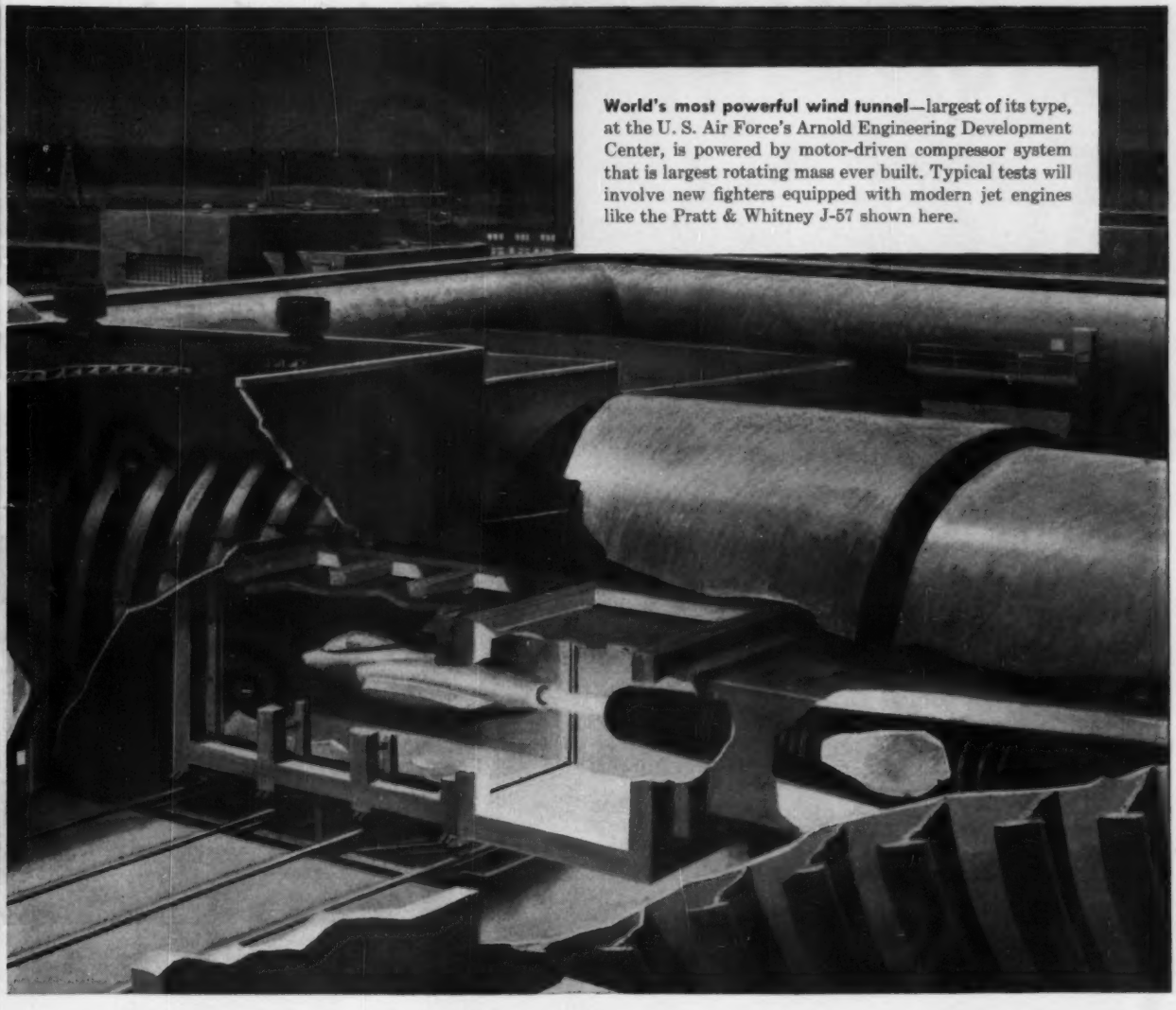
World's first atomic-powered submarine —U.S.S. Nautilus travels on power generated by fissionable material.

World's only diamond-making machine —develops up to 1,500,000 lbs. pressure and 5000°F. temperatures to create genuine diamonds.

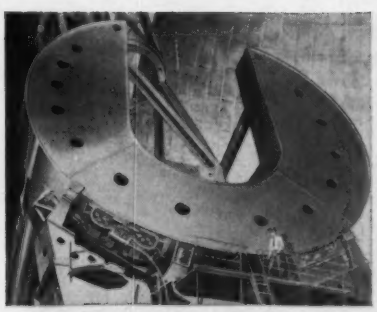


Giant atomic accelerator—the Cosmotron at Brookhaven National Laboratory is powered by a Mobil lubricated Westinghouse Motor Generator.

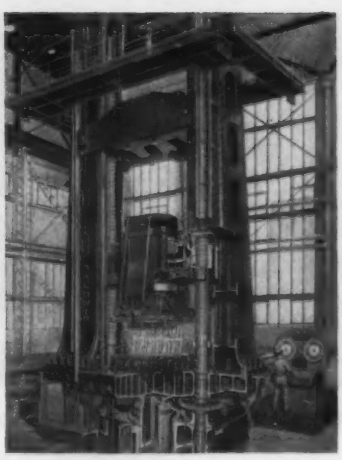
SCIENTIFIC WORLD



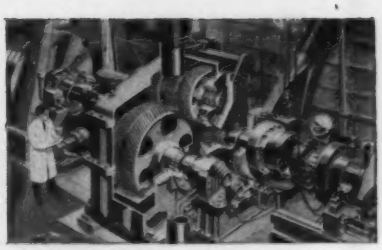
World's most powerful wind tunnel—largest of its type, at the U. S. Air Force's Arnold Engineering Development Center, is powered by motor-driven compressor system that is largest rotating mass ever built. Typical tests will involve new fighters equipped with modern jet engines like the Pratt & Whitney J-57 shown here.



World's largest telescope at Mount Palomar Observatory has 200" lens, weighs 500 tons. It floats on microscopic film of Mobil D.T.E. Oil.



World's largest testing machine can apply a tensile or compressive force of up to 5,000,000 lbs. to test full-scale sections or complete units of every type.



World's largest dynamometer tests brake materials under varying pressures, speeds and temperatures. 200-ton machine is 100% Mobil protected.

Bath Iron Works' crane loads reel from flatcar to barge.

Cable laying

LOCAL NEWSPAPERS seldom get excited over the laying of a submarine cable. But when Central Maine Power Company announced plans to link the island of Islesboro with a new 12,000-volt underwater cable, newspapers throughout the state covered the event.

The new cable, three inches in diameter and 2.3 miles long, was made in one length with no splices permitted. The cable, reel and cradle weighed *63 tons*, and in the whole area north of Boston there was only

CMP officials check final armoring of cable at mill.

71-year-old "Seguin" stands by ready to help.

CMP crew boards launch during the pre-dawn hours.

makes headlines in Maine

one water-front crane (owned by Bath Iron Works) big enough to load the reel onto its barge. Even the tugboat was newsworthy; it was the venerable "Seguin," one of the oldest tugs on the coast, built in Bath 71 years ago.

The actual cable laying was directed by Al Young, CMP's Eastern Division line superintendent. Under radio control, the barge started off at daybreak to lay the cable in the 220-foot-deep (maximum) water. The laying took only three hours, and the barge reached the far shore at high tide (as calculated), so it could get close to the shore.

The Tiger Brand cable was made up of three No. 2 conductors covered with conducting fabric tape, $^{21}/_{64}$ inch of marine rubber insulation, color-coded fabric conducting tape again, then a tinned copper tape that furnishes additional shielding and also protects against the toredo or "ship worm." Saturated jute fillers and a binder of rubber-filled tape complete the core.

Two layers of asphalt-saturated jute are spirally applied in opposite directions, followed by the all-important No. 6 galvanized steel armor wires. A final asphalt coating is applied, then a layer of chalk to prevent sticking.

• • •

If you'd like more information about submarine or any other kind of high quality Tiger Brand cable, just call your American Steel & Wire salesman.

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS TIGER BRAND ELECTRICAL WIRE & CABLE

A STANDARD TIGER BRAND CABLE FOR EVERY SPECIAL JOB

- asbestos wire and cable
- mold cured portable cord
- shovel & dredge cable
- paper & lead cable
- varnished cambric cable
- interlocked armor cable
- special purpose wire & cable
- aerial, underground and submarine cable

UNITED STATES STEEL

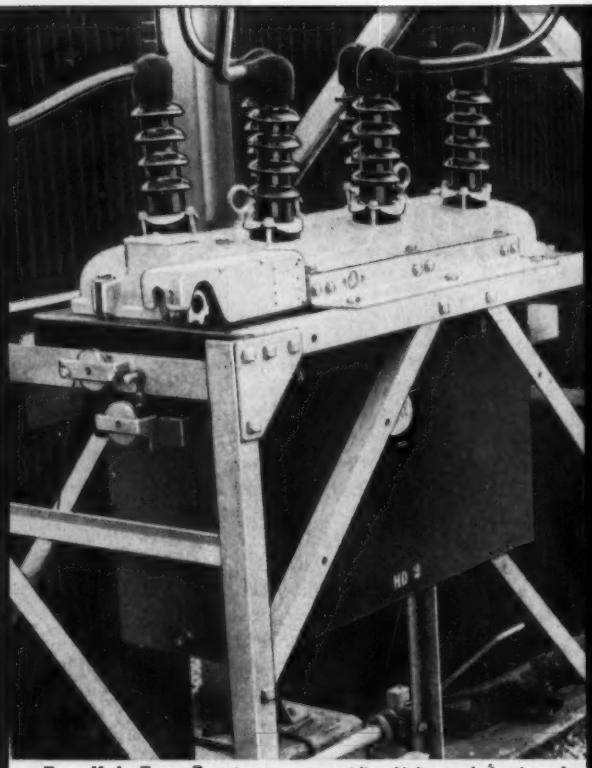
Trawler maneuvers barge with reel into position.

End of the line. Cable is trenched, potheads are on pole.

Analysis of Savings Using Kyle Reclosers for Five Years*

	Savings on 100 Substations	
I. Initial Investment Costs		
A. At substation. A Type R OCR as compared with an equivalent OCB with AC tripping and reclosing.		
1. Initial savings in equipment costs favoring each OCR—$3227.00. Total savings for 100 substations for 5 years— 2 x 5 x 100 x $3227/20	$161,350.	
2. Initial savings in labor costs to install transformers and wiring necessary to operate OCB—$30 per OCR. Total savings for 100 substations for 5 years— 2 x 5 x 100 x $30/20	1,500.	
Total initial investment savings with OCR's		$162,850.
B. On distribution feeders with 5 sectionalizing points per feeder.		
1. Equipment costs of 3 OCR's and 2 sectionalizers exceeding that of 5 fused cutouts = $491. Additional costs to utilize self-protective scheme for 200 feeders for 5 years = 5 x 200 x $491/20 (—)	$ 24,550.	
2. Labor costs of installations. OCR exceeding that of fused cutout = $15. Additional cost to utilize self-protective scheme for 200 feeders for 5 years = 5 x 200 x $15/20 (—)	750.	
Total additional costs of OCR's and sectionalizers over fused cutouts		— 25,300.
C. Net savings in initial costs with OCR's		$137,550.
II. Operating Costs (estimated 9 outages per feeder through transient conditions annually)		
A. Savings in frequency and duration of service trips resulting from transient faults		
40 man-hours @ $5/hr. per feeder.	$200.	
25 truck hours @ $1/hr. per feeder	25.	
Cost of fuse links per feeder	5.	
Total cost of transient outages per feeder	$230.	
Total 5-year cost for 100 substations = 5 x 2 x 100 x $230	$230,000.	
B. Increased revenue resulting from reduced outages. 1500 KWH per outages per feeder for 5 years through loss of service @ 2¢ per KWH = 1500 x 2 x 100 x 5 x $.02	30,000.	
C. Total savings from transient fault protection for 5-year period		$260,000.
III. Maintenance Costs		
A. OCR and sectionalizer maintenance cost @ $25 per unit annually = $25 x 5 x 2 x 100 x 5 (—)	$125,000.	
B. OCB additional relay calibration costs @ $25 per unit annually = $25 x 2 x 100 x 5	25,000.	
C. Total additional costs of OCR and sectionalizer maintenance for 5 years		— $100,000.
IV. Carrying charges (conservatively estimated as 10% annually of initial capitalized investment)		
A. At substation. Savings represented by OCR's = ($3227 + $30) x 2 x 100 x 5 x .10	$325,700.	
B. On line, additional cost of automatic scheme = ($15 + $491) x 2 x 100 x 5 x .10 (—)	50,600.	
C. Savings in carrying charges with OCR's and sectionalizers		$275,100.
V. Subtotal		$572,650.
Additional savings resulting from Transient Fault protection		
VI. Savings realized by elimination of conductor and equipment damage through extra-fast clearing on heavy faults		$?
VII. Value of improved public relations realized through better continuity of service		$?
VIII. TOTAL SAVINGS	**Well over half a million dollars!**	

**Costs are conservative estimates based on the best available information from utilities. System used to illustrate average installation consisted of 100 substations each with two 15 kv feeders, and amortized in 20 years.*



Two Kyle Type R reclosers are providing high-speed clearing of 13.8 kv feeders for transient fault protection and automatic disconnecting of permanent faults with minimum substation investment.

How Heavy-Duty Substation

The application of Kyle reclosers as the automatic disconnecting device in substations eliminates the relatively high costs of circuit breakers and associated substation equipments. This alone offers savings of a half million dollars or more in five years, based on 200 feeder positions.

Lower Initial Costs

Initial investment in Type R recloser equipment of equivalent rating will result in approximately $3,000 savings per feeder. In addition, field reports indicate that labor for installing Type R reclosers is about 50% of that for circuit breakers. The maintenance cost for reclosers is also lower than for circuit breakers.

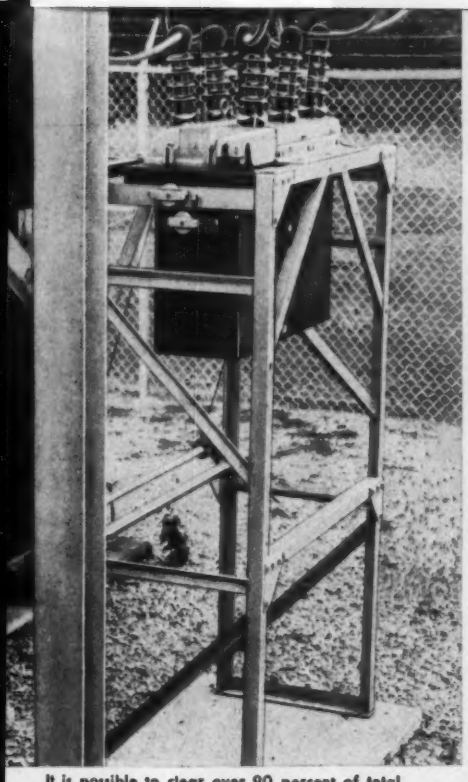
Fewer Outages

L-M Kyle reclosers can also be justified as a fault-protective device that will reduce the number of outages caused by transient or non-persistent causes. Kyle reclosers have extremely fast opening characteristics, clearing circuit in less than 2 cycles, which minimizes conductor burndown and increases service continuity.

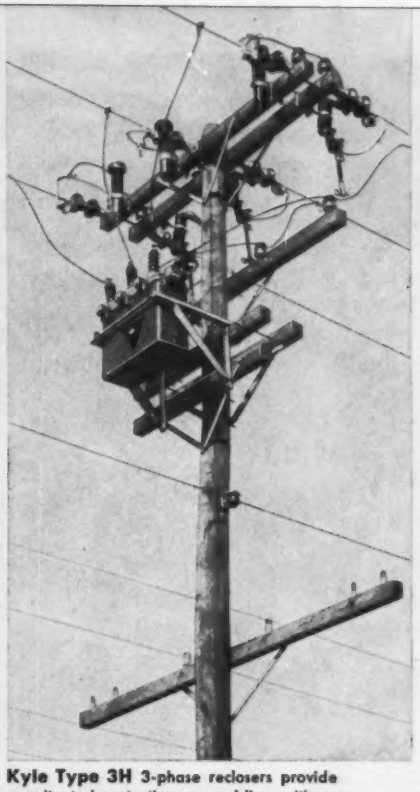
Compare the figures at the left with your construction and operating costs and see how you can save over a half million dollars with Kyle reclosers.

LM® **LINE MATERIAL**

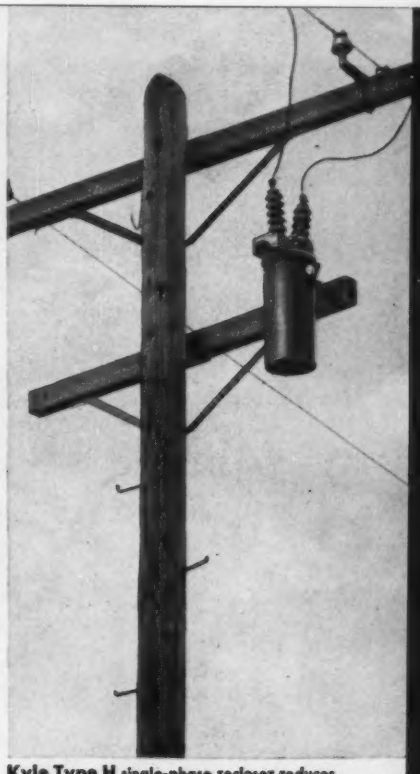
McGRAW-EDISON COMPANY



It is possible to clear over 90 percent of total circuit faults and reduce permanent faults with high-speed Kyle reclosers.



Kyle Type 3H 3-phase reclosers provide coordinated protection on rural lines with up to 1250 amperes at 14.4 kv. Where faults persist, recloser locks open on all 3 phases and confines trouble to a small area.



Kyle Type H single-phase recloser reduces the number of outages on rural lines caused by conductors whipping together on long spans, small branches grounding a conductor, or a lightning discharge.

Kyle Reclosers Reduce Investment And System Operating Costs

L-M high-speed reclosers provide better service continuity and lower operating costs by reducing conductor burndown caused by transient or non-persistent faults on the system. It is possible to clear over 90 percent of total circuit faults and reduce permanent faults with high-speed Kyle reclosers. Such faults are often caused by lightning, arrester flashover, tree limbs shorting the conductors, or conductors whipping together on long spans.

Eliminate the Shaded Area

The shaded area in the chart at right represents the additional fault-clearing ability of L-M high-speed Kyle reclosers. Kyle reclosers clear transient or non-persistent faults on the circuit with no significant damage to the system or interruption of service.

All Kyle reclosers can be coordinated in series to provide complete transient protection over entire distribution system.

Get Complete Information

Ask the L-M Field Engineer for more information on how Kyle reclosers can be profitably applied to your system. Or write Line Material Company, Milwaukee 1, Wisconsin. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario.

282R

Kyle® Reclosers

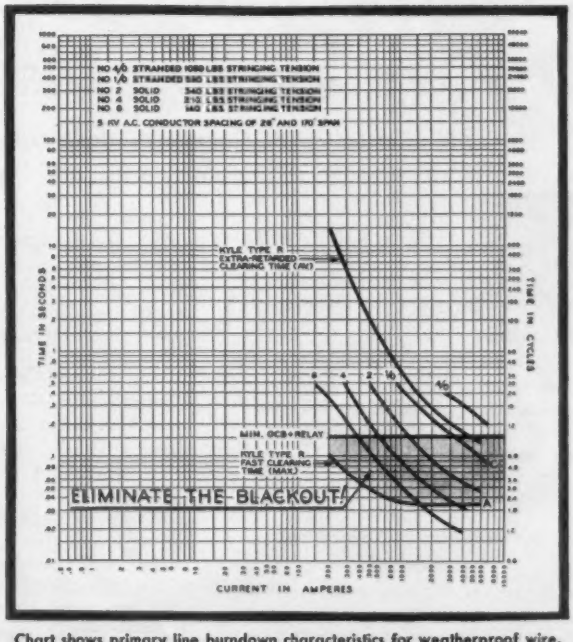
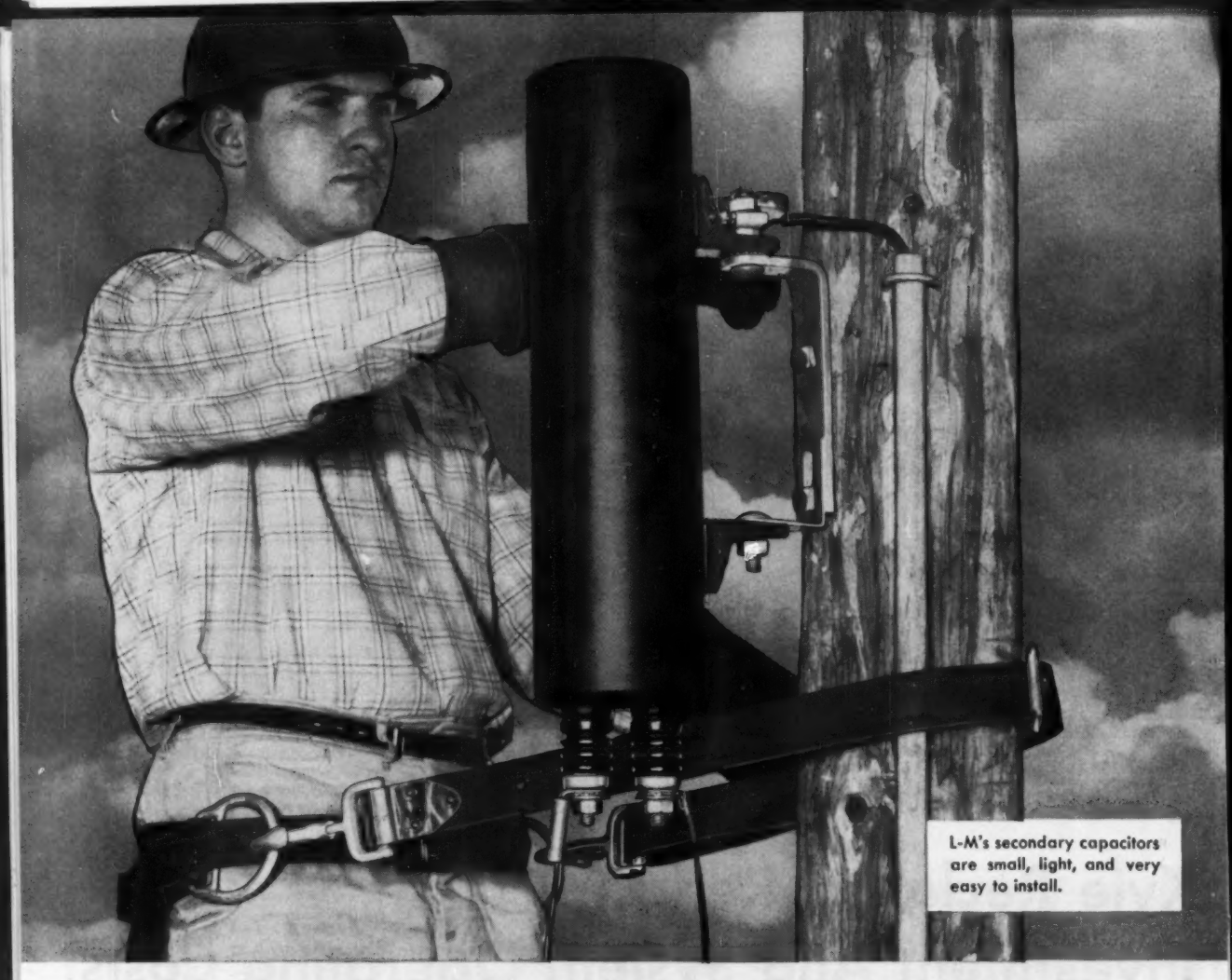

NO 4/0 STRANDED 1080 LBS STRINGING TENSION
NO 1/0 STRANDED 540 LBS STRINGING TENSION
NO 2 SOLID 340 LBS STRINGING TENSION
NO 4 SOLID 210 LBS STRINGING TENSION
NO 6 SOLID 140 LBS STRINGING TENSION
5 KV A.C. CONDUCTOR SPACING OF 28" AND 170' SPAN
KYLE TYPE R — EXTRA-RETARDED CLEARING TIME (AV.)
MIN. OCB+RELAY
KYLE TYPE R — FAST CLEARING TIME (MAX.)
ELIMINATE THE BLACKOUT!
TIME IN SECONDS
TIME IN CYCLES
CURRENT IN AMPERES

Chart shows primary line burndown characteristics for weatherproof wire. It also gives the maximum clearing time for high-speed Kyle reclosers and minimum clearing time for the average circuit breaker plus relay time. The shaded area represents the additional protection that can be obtained with Kyle reclosers in place of circuit breakers.



L-M's secondary capacitors are small, light, and very easy to install.

L-M Secondary Capacitors Improve Overloaded Distribution System

L-M offers complete line of secondary capacitors as an economical means to increase load capacity, reduce load losses, and improve voltage level of secondary system.

By **N. K. DELANEY**
Product Manager
Capacitors and Regulators
Line Material Company

The effectiveness and economic worth of secondary capacitors have increased considerably because of the heavy load growth from motored appliances. Many residential secondary systems have been forced to operate with loads having as low as 70-percent power factor.

Advantages of Secondary Capacitors

By improving the power factor in the secondary circuit, secondary capacitors can provide the same benefits as obtained by installing larger distribution transformers, heavier secondary conductors, or voltage regulators, and can do this at appreciably less handling and installation costs. This comparison, of course, must be within the range obtainable by power factor correction.

Transformer Capacity Increased

The maximum benefit from secondary capacitors is obtained at the most advantageous period, which is during peak-load conditions. The chart, Fig. 1, shows the decrease in transformer loading obtained by adding capacitors to the transformer secondary, and Fig. 2 shows the recommended number of capacitor units with various transformer ratings.

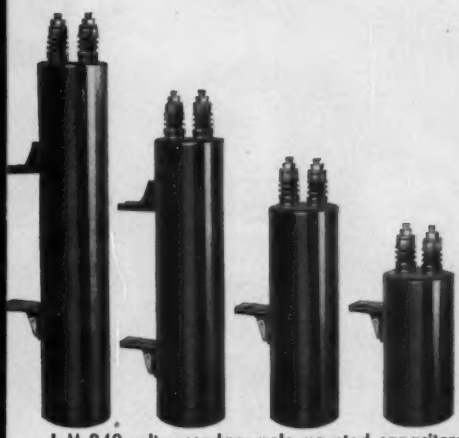
Load-Loss Reduction

The combination of transformer and secondary capacitor is more efficient than a transformer large enough to carry the load. The secondary capacitor, by increasing the power factor of the load, reduces the amount of current that has to flow through the transformer and secondary conductors.

Voltage Improvement

The value of voltage improvement with secondary capacitors is equal to the same amount of fixed primary kvar, *plus* the voltage rise through the distribution transformer and affected secondary.

LINE MATERIAL
McGRAW-EDISON COMPANY



L-M 240-volt secondary pole-mounted capacitors are available in 10, 7½, 5, and 3 kvar ratings. See chart for height and weight.

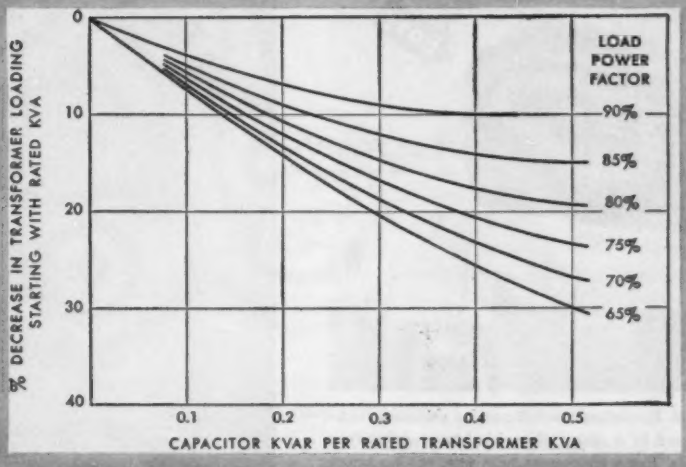


FIG. 1—These curves show how you can decrease transformer loading—at various power factors—by adding secondary capacitors.

L-M's unique carton permits easy testing of capacitors without removing them from the carton.

Distribution Transformer Rating in KVA	Recommended Number of Capacitor Units			
	3 KVAR	5 KVAR	7½ KVAR	10 KVAR
10	1	—	—	—
15	2	1	—	—
25	3	2	1	1
37½	4	3	2	1
50	6	4	2	2
75	9	5	3	3

FIG. 2—The above chart shows the recommended number of secondary capacitor units with various transformer ratings.

Capacitor Location

To obtain the maximum benefit, capacitors should be installed in pairs, located from ⅔ to ¾ the distance to the end of the secondary, in each direction. This recommendation is based on a reasonably uniform load distribution and secondary conductors in two directions from the transformer.

L-M Offers Complete Line Of Capacitor Equipments

L-M's 240-volt secondary pole-mounted capacitors are available in 3, 5, 7½ and 10 kvar.

L-M's 216-volt, 13⅓ kvar submersible capacitors are available in 40, 80, and 120 kvar racks, completely assembled at the factory ready for field installation.

L-M's complete line of primary capacitor equipments includes pole-mounted, single and multi-row racks, factory-assembled blocks and metal-enclosed equipments. Most capacitor equipments are available in 2400- to 13,800-volt, 25 or 50 kvar capacitor units.

Some Outstanding Features Of L-M's Pole-Mounted Secondary Capacitors

Leads of 48-inch, 600-volt wire furnished as standard equipment.

Bushing-Mounted Fuse with 48-inch lead can be supplied.

Solder-Sealed Bushings of strong one-piece wet-process porcelain provide a positive, lasting seal.

Pole-Mounting Bracket has two 9/16″ holes for ½″ lag screws. Standard EEI-NEMA crossarm-mounting bracket furnished if required. Capacitor can be mounted with bushings up or down.

Aluminum Metallizing process protects steel tank from oxidation; is followed by a chromate primer and a finish coat of alkyd resin paint.

Round-Pack, Round-Tank Design makes these capacitors small, light, easy to install. Unit has a one-minute discharge resistor; is completely impregnated under vacuum with low temperature Elemex liquid dielectric.

Weight and height of L-M's 240-volt, pole-mounted secondary capacitors.

Size Kvar	Height Inches	Net Weight* Pounds
3	13⅛	17
5	17⅜	23
7½	23⅜	31
10	29⅜	39

**Weights include the pole-mounted brackets.*

Get The Whole Story On L-M's Capacitor Equipments

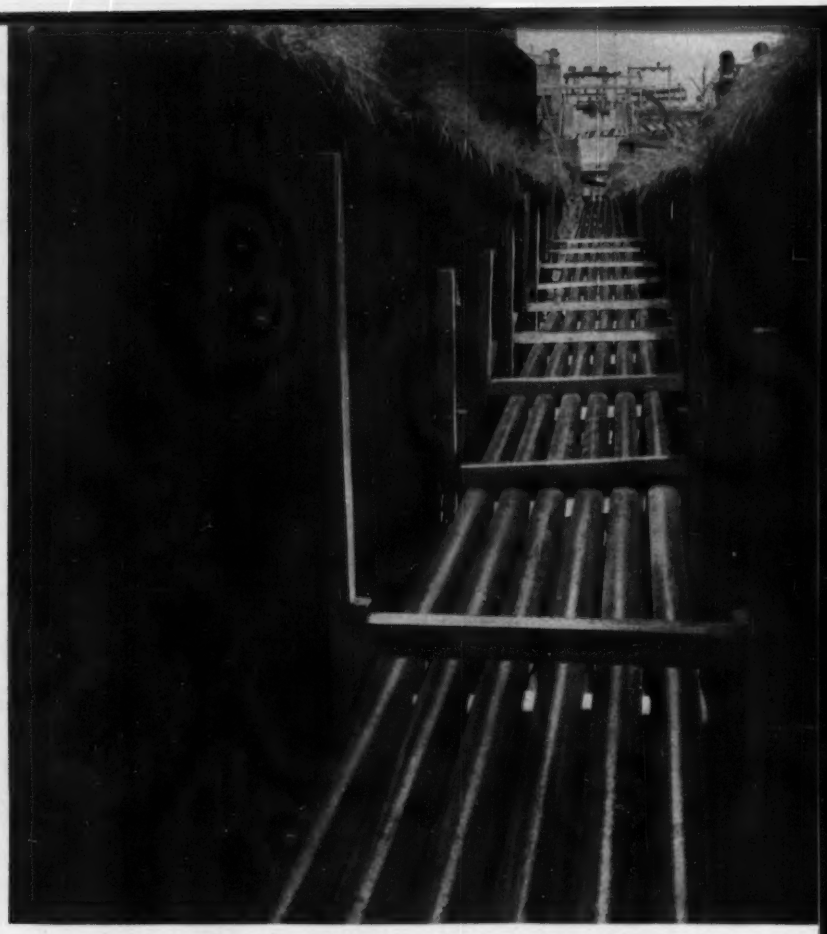
Ask the L-M Field Engineer for complete information and bulletins on the construction and application of L-M's full line of primary and secondary capacitor equipments. Or write Line Material Company, Milwaukee 1, Wisconsin.

257-R4

Elemex® Capacitors

L-M Permaline conduit can be shipped packaged in a sling. Here is a crane unloading 744 ft. of conduit at one time, saving hours of unloading time.

Lift truck is handling 512 ft. of conduit. L-M Permaline conduit is available on pallets to save handling. The time-saving is worth the slight additional cost.



L-M Permaline fibre conduit was used in 132 kv primary, 26.4 and 13.2 kv secondary duct runs for a large bulk substation. Permaline's smooth inner bore makes cable easy to pull, and reduces cable sheath abrasion.

Here's Why L-M's Permaline Conduit Is Easy To Handle, Easy To Install

Line Material makes it easy for you to handle Permaline fibre conduit in the material yard and on the job. For a slight additional cost, L-M packages the conduit in slings or on pallets for unloading in the material yard. This way large quantities of conduit can be unloaded in minutes with a crane or a lift truck. In the pictures above, a crane is unloading 744 ft. of conduit at one time, and the lift truck 512 ft. The next time you buy conduit, be sure to order L-M Permaline conduit in slings or on pallets and save hours of unloading time.

Permaline Is Laid Faster

L-M Permaline conduit also comes in long lengths. It is light, easy to handle on the job and in the trench. Joints are quickly and easily made by simply tapping the tapered couplings onto the tapered end of the conduit. Joints are watertight and safe from seepage of wet concrete and soil water. You'll find that Permaline conduit can be laid faster than many other types of duct.

Complete Line of Duct and Accessories

L-M Permaline conduit is available in 5-foot lengths, sizes 2, 4, 5, and 6 inches; also 8-foot lengths, sizes 3, 3½, 4, 4½, and 5 inches.

L-M has a complete line of accessories which include:

Spacers for any duct configuration.

Bends and angle couplings, including 5° angle couplings, S-bend, 45° and 90° bends.

Bell ends for use at conduit terminals.

Fibre caps to seal duct lines prior to drawing cable.

100% Salvage

L-M Permaline conduit can be cut with a hand saw. Smooth, precision tapers can be cut in the field with L-M's tapering tool, providing 100% salvage of field-cut ends.

Get Complete Information

L-M offers a completely engineered system for conduit installations. Ask the L-M Field Engineer for a copy of the 12-point plan folder, which shows how easy it is to use our system; or for Bulletin UG1A, which gives construction specifications. Or write Line Material Company, Milwaukee 1, Wisconsin. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario.

LINE MATERIAL

McGRAW-EDISON COMPANY

Permaline Fibre Conduit

BPI BITUMINOUS PIPE INSTITUTE

This seal is your guarantee of recognized quality in Bituminous Fibre Conduit.

265R

EDITORIALS

Right-of-Way Men Need a Forum

"There is no place at present where the electric utility right-of-way man can express his opinion; there is no sounding board. If there were . . . we could coordinate our opinions and get a consensus."

It was apparent from this and other similar comments at the Electrical World right-of-way meeting in Chicago last month (see page 68) that there is a continuing need for a committee to coordinate work in this important field.

It now appears that the American Right of Way Association will set up new sections, among them one for electric utilities. This is certainly a step in the right direction. Constructive as this step is, there may still be need for a right-of-way organization exclusively for electric utilities—or perhaps for a committee within the Edison Electric Institute.

Electrical World will follow progress in the solution of right-of-way problems and give help where it can to industry and other groups tackling the many and complex difficulties.

Larger Substation Shift Standardization Emphasis

Distribution design today shows a clear-cut trend to bigger substations and larger feeders, in step with the growth in per-customer use of electricity. This trend reflects the same drive for economy that is doubling turbine-generator ratings and boosting transmission voltages.

Glimpses of this trend have been noted with growing frequency in recent years. But it came into sharp focus (EW May 13, p 92) when Oklahoma Gas & Electric Co found it could save 25% by using up to 75-Mva substations to serve 9,800-kva, 12.5-kv feeders instead of 12.5-Mva substations in a more conventional system. Alerted by this revelation, distribution planners will recall other utilities which are boosting station and feeder ratings for their 12 and 13-kv systems.

For today's conditions this trend to larger substations for 12.5 kv distribution seems clearly justified. Feeders that would be hard pressed to carry 2,800 kva at 4 kv acquire 8,400-kva capability at the higher voltage. And their greater reach offers opportunity to group feeders on the same regulated bus. By exploiting the continued decline of cost per kva for larger transformer and feeder ratings, the distribution designer finds economy in ratings far higher than those of the conventional system in common use today.

Such justification of extremely large substations seems to mark a sharp shift in distribution planning. Some critics may even see in it a contradiction of the unit substation philosophy that for two decades has molded the expansion of many utility systems.

But we view this trend as a logical, evolutionary development to which the unit concept has already made valuable contributions and will continue to contribute in years to come.

- Pre-eminent among these continuing contributions to distribution design is the sweeping economy of stream-lined circuitry, repetitive manufacture, and rapid field erection.
- Equally significant to both past and present trends is the severe simplicity of the unit concept;

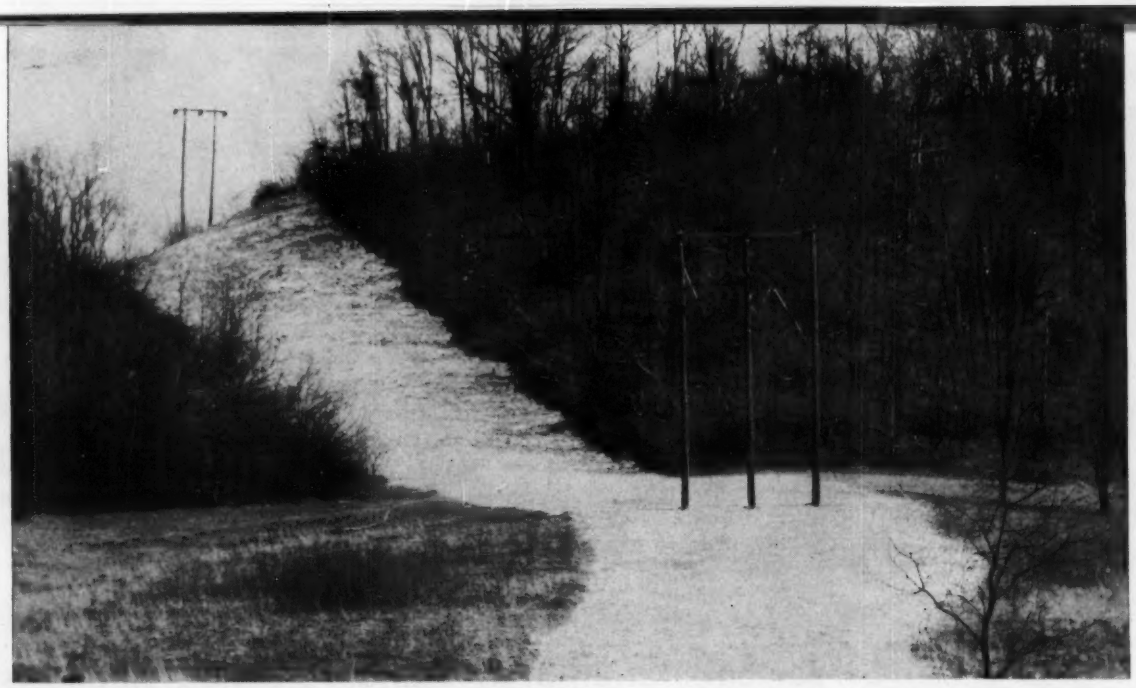
. . . with only one subtransmission supply per transformer,

. . . with no high-side bus or switchgear and only the absolute minimum on the low side,

. . . with load tap-changing built into the transformer to eliminate separators

. . . and with the assembly shipped as standardized components for rapid erection.

Such functional simplicity as this helped distribution to keep pace with the soaring demands of war and postwar years. The philosophy which developed it offers equal promise in the era of bigger substations and larger feeders of higher voltage rating. After all, distribution design is inherently repetitive. It thrives on the structural standardization and simplicity exemplified in the unit substation. This philosophy should be perpetuated in the newer bigger substations of tomorrow.



R/W Men Explore Coming Problems

One major conclusion stands out from the Electrical World Right-of-Way Meeting held last month in Chicago. Utilities that are not allocating money and resources to solve tomorrow's R/W problems are courting trouble far out of proportion to the funds or time saved now. Many are already ensnared in costly delays.

Virtually all electric utility speakers emphasized the need to acquire sites and R/W five or more years in advance of construction. As they described methods being used to solve or minimize dilemmas, the 105 registrants kept notebooks open and pencils flying. As one R/W man remarked, "This meeting is the first chance we've had to see where we stand."

His reaction was typical. Because of this Electric World believes this first national gathering of electric utility R/W men achieved its goal—to open nation-wide channels of communication for the exchange of ideas and practices.

Best way for the R/W man to get management backing on advance acquisitions is through long-range planning. This was suggestion of Murray Joslin, vice president of Operations, Engineering & Construction, Commonwealth Edison Co. Over-all load growth can be forecast but it's difficult to anticipate it by areas, he cautioned.

"Don't overdo it, though," he said. Taxes and maintenance costs for the property have to be evaluated.

He advised these steps:

- Work closely with employees in areas where R/W is being bought.
- Inform residents of future use intentions to avoid problems from platting and uninformed purchasers of adjoining land.
- Greater effort to cut UG construction costs.
- Increase EHV bulk power transmission.

Planning engineers have given Richard H. Taylor, director, real estate and right of way, Detroit Edison Co, a system map with overlays showing anticipated h-v system for 1960-65-70. "And we're acquiring some of these rights of way today," he said.

Taylor, moderator of the meeting's four panels, stated, "Savings on acquiring this R/W now cannot even be estimated. We're stopping construction of $25-$50,000 ranch homes which it would be necessary to purchase if we attempted to (go) overhead at 345-kv five years from now." "Purchase at least five years ahead," said A. W. Althouse, R/W manager, Southern California Edison Co. For sites acquired in advance, he recommended fencing, landscaping, and appropriate posting to minimize neighborhood and zoning difficulties when facilities are installed.

Buying R/W in fee simple warrants serious consideration, he said. Even with carefully drawn, tight easements, "future changes in use of adjacent lands far too often result in encroachments."

Utilities could save ten times the money spent on last-minute R/W acquisitions if they secure it in advance. This figure is based on estimates of Frank Balfour, chief R/W agent, California Division of Highways, since passage of a state law in 1952 providing a revolving fund to "buy ahead." To date $31 million has been spent and some $368 million saved by getting R/W before business and residential development begins.

Outlook for EHV

Characteristics and requirements for R/W were forecast by Carl H. Lindell, superintendent, transmis-

sion engineering, Cincinnati Gas & Electric Co:

1. Future will bring 380 kv or higher.
2. Most towers will be double circuit.
3. R/W widths will be 150 to 200 ft.
4. Number of structures will be slightly less than 138-kv average of 5.2 towers per mile.
5. Minimum conductor clearance will be greater.
6. Bundled or twin conductors will predominate.

Lindell said main concern for EHV routes is additional width requirements.

To avoid abandonment injunctions on R/W acquired in advance, Cincinnati G&E puts a clause in grants. In effect, it says if R/W isn't used within 25 yr it reverts to the property owner.

Personnel Practices

"You can't derive a formula for finding the right man for right of way." But you can follow up on men referred by employees in departments and divisions, and by individuals outside the utility, said Clyde K. Wallace, land and title supervisor, Consumers Power Co. Former farmers; city, village, township, and state officials; and former real estate and small businessmen are likeliest prospects.

Training the New Man

Local and national meetings of ARWA, American Institute of Real Estate Appraisers, and other groups provide good learning oportunities for newer men, said R/W Agent A. Stevenson, Union Electric Co. Buyers of fee property and major transmission line R/W take a 44-hr course at Washington University in St. Louis. It includes credits in real estate, appraising, land development, taxes, titles, and conveyances.

College courses help he said, but actual training under an experienced man is also essential. And "there is no training that can replace a rural background."

In addition to financial importance of good R/W work, "we have a human relations problem" because most owners are also customers. So said Kirkwood Personius, land agent, New York State Electric & Gas Corp. It is the agent's responsibility to express the utility's desires in a straightforward, courteous, and friendly manner.

Land Title Aids

Deilineating and locating the R/W strip in the easement can save time and expense, said William A. Thuma, Chicago Title & Trust Co. Blanket easements may cause trouble when center line footage isn't spelled out. Before obtaining easement grants from railroads and other utilities "first determine whether the railroad owns the fee simple title to the land . . . and that in fact the railroad does not itself have but an easement."

And "why not clearly ask for the fee simple title" in condemnation petitions if state laws permit it, Thuma asked. Remove any doubt by asking for title in just those words, he advised.

Appraising Appraisals

Gulf States Utilities Co secures appraisals by independent appraisers on each tract in transmission R/W before making land owners an offer. It's a "very satisfactory practice," said Harold L. Berly, R/W agent. Previously offers were on lineal rod basis. Now they're based on acre measure.

Growth is normally included in setting market value for timber land, Berly said. But this is generally based on "cut over"—land from which best saw trees have been removed. Tracts are then valued at same amount per acre plus actual market value of timber growing in the R/W on each tract. Basis for cultivated land R/W is about one half appraised market value.

Thomas N. Wright, Iowa Power & Light Co attorney, defined easements and conveyances of title and their characteristics. Cost factors for deeds are higher than easements because easements represent a less extensive bundle of rights, he said. But make-up of the area, severance, and extent of maintenance are factors to be evaluated before choosing.

"Many of you are still carrying on in the same old horse and buggy," when it comes to acquiring R/W, said Appraiser C. O. Crawford, MAI of Indianapolis.

Methods of R/W valuation through farm, suburban, and industrial areas were described by Crawford. If full market value for land in the easement strip is paid, "you have paid too much," he said. "Pay only for what you take." Compensation to a subdivider should be based on raw land costs before development, Crawford said.

Avoiding Condemnations

A big aid in avoiding condemnations is to avoid "the construction department coming over the hill when you're buying R/W," said I. H. Boinest, R/W engineer, South Carolina Electric & Gas Co.

Their agents contact property owners after the line survey, Boinest said. The fact that a flurry of condemnation papers were served three years ago hasn't hindered negotiations.

Zoning Needs

West Penn Power Co is among utilities which enjoy recourse to state commissions in six states for exemption from zoning regulations, providing necessity is proved. Charles Adams, West Penn's real estate manager, said this doesn't eliminate all stumbling blocks, however. His utility uses men known as community representatives who, with R/W agents, keep abreast of regional planning and zoning.

Public officials must be "fully aware of our needs and the power requirements of their areas," said A. H. Richards, manager, transmission and distribution engineering, Cleveland Electric Illuminating Co. This puts the responsibility of educating them upon utilities.

Richards told how zoning snags have delayed his firm's major lines and substations up to two years since 1952. "If we had the privilege of presenting original applications to public utility commissions and getting their approval before going to local bodies, I am sure we would get more favorable consideration," he stated. Otherwise utilities will continue to face increased construction costs, installation of temporary facilities for load relief, and, in some cases, unreasonable overloading of equipment and lines caused by zoning delays.

Copies of proceedings are available. Write R/W Editor, Electrical World, 330 W. 42 St., New York 36, N. Y. Price $5.00.

Will Murray Win AEC Reappointment?

Commissioner's hopes for retaining post rise; Ike, though non-committal, may favor second term despite strong opposition from Strauss

V. CRAIG RICHTER,

Washington Correspondent

Washington experts have been convinced for some time now that there was not a chance in the world that President Eisenhower would reappoint to the Atomic Energy Commission Thomas E. Murray, Democrat, whose term expires June 30.

Basically, this stems from the heated opposition of AEC Chairman Lewis E. Strauss, who is Eisenhower's closest advisor on atomic matters—plus the manner in which Eisenhower gave a brusque but non-committal reply to a question on the subject at a news conference.

Now Murray and his supporters are campaigning for reappointment. They believe Eisenhower might eventually decide in Murray's favor.

Often a Lone Dissenter

Murray and Strauss have been at each other's throats on a number of issues. The other two AEC commissioners, Dr Willard F. Libby and Harold S. Vance, have not become publicly involved in the squabbles, but invariably they have lined up with Strauss whenever the chips were down. Thus Murray frequently has been the lone dissenter on AEC.

Now the Murray forces contend if Eisenhower can be reached by the proper people, he might override Strauss. They believe, in fact, an indication of utility industry support for Murray would swing the scales in his favor.

Murray's friends point to the advantages to the Administration that would stem from his reappointment. It would contribute toward placating Congressional Democrats, they say, and stop the Democratic threat to scuttle the Administration's atomic power reactor program including the liability insurance bill.

On the other hand, failure to reappoint Murray promises to produce a real donnybrook in Congress to the detriment of the atomic power program. Certainly Congressional Demrocrats would look with suspicion on an AEC minus Murray—the one commissioner who has never hesitated to clash with Strauss' policies when he felt they were wrong.

Brought Unwelcome Publicity

Murray, who believes strongly that government-industry dealings must be in the open for all to see, has had his worst rows with Strauss over AEC secrecy. He gave aid and comfort to Strauss' foes in the Dixon-Yates and Power Reactor Development Co cases so Strauss policies in both cases have brought publicity that the industry and AEC would have preferred to avoid.

With regard to reactor acceleration, Murray's position has been consistent. He has argued all along for federal financial and technological assistance—that the early costs of atomic power are fairly staggering without any guarantee of quick improvement, and that time is of the essence, not for domestic reasons, but for international political prestige reasons.

Rep James Van Zandt (R-Pa.) said as much in introducing his reactor acceleration bill recently. Murray has said it for two years.

Murray doesn't want the government in business any more than the staunchest Republican does. But he believes it is short-sighted of industry to oppose the government in undertaking extremely costly gambles in building large-scale prototype power reactors primarily as an instrument of international policy. He argues that stopping the government today does not ensure that there won't be federal commercial atomic power plants at some future date under another administration.

The reappointment would solve many problems for the President. The Republicans would have trouble finding another Roman Catholic Democrat with Murray's qualifications.

Defends Power Industry

He knows the power industry (and has never hesitated to defend it in principle) first through his father who built many power stations and later through running the family electrical manufacturing business. As a mechanical engineer, Murray has over 200 electrical and welding patents to his name.

His standing in Congress is good. This was demonstrated when he backed Eisenhower's position with regard to the International Atomic Energy Agency. Although the Senate has not yet ratified the treaty, there was noticeable lessening of important GOP opposition to it after Murray spoke. His reappointment would help smooth the way in Congress for resolving the tangled web of future atomic power reactor policy and atomic liability insurance.

CAPITAL BRIEFS

Senate Interior Committee has approved a bill for the construction of $152-million **Fryingpan-Arkansas** project in Colorado. Measure was defeated in the House last year. It is now ready for floor action.

Federal Power Commission has issued a license to **Chugach Electric** Association, Inc, Alaska, for a $6 million, 15,000-kw hydro project on the Kenai Peninsula.

A compromise agreement on development of **Niagara power** has been approved by a Senate public works subcommittee. It calls for making, subject to the federal preference clause, one-half of the power derived from the project with these two limitations: (1) 20% of the preference power would go outside New York State, and (2) To qualify for the power, preference customers would have to be located within "economic transmission distance" of the power site. Subcommittee lets Federal Power Commission decide economic transmission distance.

A bill to amend the **Tennessee Valley Authority** act has been introduced in the Senate by Edward Martin (R-Pa.). It would authorize TVA (1) to sell up to $750 million in bonds, notes, or other indebtedness; (2) to require it to charge just and reasonable rates; (3) to have its rates subject to the jurisdiction of the Federal Power Commission; and (4) to require certain payments to the U. S.

House Interior Committee expects to receive soon revised data from Interior Secretary Fred A. Seaton to guide it in deciding whether the power at the **Trinity River** reclamation project in Northern California is to be developed by Pacific Gas & Electric Co or by the federal government. Federal construction of the project, with exception of the power facilities, already is underway.

Rich Is New NEGEA Chief

His background in law won him, at 49, the top executive spot of a major group of gas and electric properties

One of the biggest problems now facing the utility industry is "to earn an adequate rate of return to stockholders capable of meeting present inflationary conditions."

This is an opinion of John Fletcher Rich, new president of New England Gas & Electric Assn.

Born in Lincoln, R. I., in 1908, the son of a lawyer father, Rich received his A.B. degree from Dartmouth College in 1930 and went on to an LL.B. at Harvard Law School three years later. In the depressed condition of the nation at that time an opportunity came to this Phi Beta Kappa key holder to work in the Buffalo, New York, firm of Slee, O'Brian, Hellings & Ulsh with whom he remained for four years.

Likes Corporation Finance

Corporation finance interested him more and more as time went on and in due course he became a partner in the firm of Burns, Currie, Walker & Rich, New York; and then with Burns, Blake & Rich of Boston. Like many other natives of New England, Rich welcomed the opportunity to return to Yankeeland and located his home in historic Lexington, Mass., where he brought up his four children and launched into numerous civic undertakings.

Has Civic Interests

"Lexington is a comparatively small town," he says, "but I well remember spending as many as three nights a week working out problems that came before the Appeal Board, dealing with zoning matters and engaging in church work."

Mr. Rich also served as moderator of Hancock Congregational Church meetings presiding over budget and fund raising committees—a sort of semi-judicial leadership which goes a long way toward harmonizing business procedure in communities and committees who are blessed with independent and open-minded thinking. He is currently a member of the board of deacons of his church.

Directorships came his way in Algonquin Gas Transmission Co, Palm Beach Co, Electronics Corp of America and the Western Union Telegraph Co. Asked about this last honor Rich said: "The powers-that-be seemed to favor the idea of Boston representation" on the communication company's board. He is also a member of the board's executive committee.

Set Up Corporate Operation

During the formation period of the Algonquin Gas Transmission Co's capital structure and the construction of its natural gas pipeline into New England, Rich was its treasurer supervising the financing work which established the basis for its present corporate operation.

In the 1943-47 period when the carrying out of the Public Utility Holding Company Act was at the forefront, John Rich was very active in this connection. Ten years ago he was named a trustee of the New England Gas & Electric Assn and has been closely identified ever since with the development of this organization at its Cambridge headquarters.

He is now president of six NEGEA subsidiaries.

THE NEWS-BEAT

Fallout Hearings May Hit A-Plant Hazards

Big purpose of hearings is to disclose what is happening to air and people

Possible public hazards posed by nuclear power reactors may be scrutinized in Washington before the current hearings on radioactive fallout end. If not, a special hearing may develop as an offshoot.

Conducted by a subcommittee of the Joint Committee on Atomic Energy, the present hearings aim primarily to establish a comprehensive public record covering what weapons testing is doing to the atmosphere and how it affects man.

In the meantime, nuclear power plant sponsors have these scientific observations to ponder:

- The reactor process yields slightly more strontium 90 than an atomic bomb. Strontium 90 is the fallout ingredient of most concern to scientists.
- The development of peaceful uses of atomic energy obviously risks release of radiation. If permissible dosage is put at zero, there can be no peaceful application of the atom. If it is drastically cut, costs of controlling it may make development of the atom infeasible.

Reactors Relatively Safe

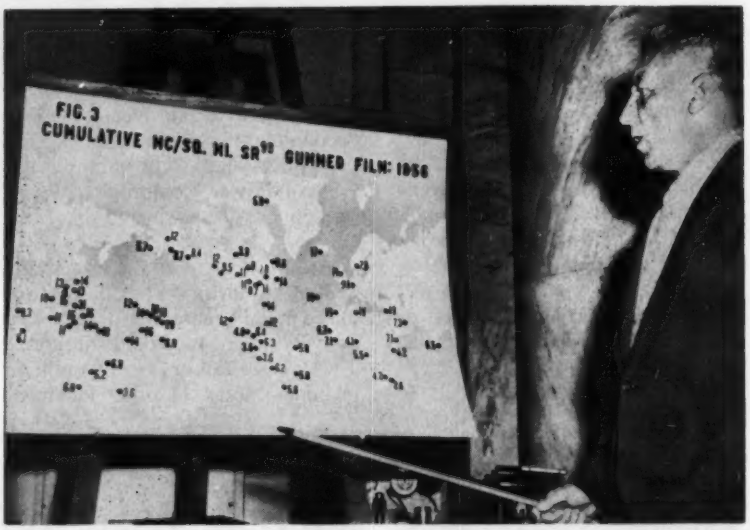
Sen Clinton P. Anderson (D-N.M.) tried to draw Dr Charles L. Dunham of AEC's division of biology and medicine into a discussion of whether power reactors would discharge more radioactivity into the air than atomic bombs. Dunham said they wouldn't.

So far the hearings have established that we are near maximum limits of weapons testing in terms of radioactive fallout; the primary cause for concern is the deposition of strontium 90 which can cause bone cancer and leukemia; that more strontium 90 is being deposited in the U. S. than elsewhere in the world; and that we need more information on effects of strontium 90 on human beings.

Other points established: fallout from nuclear weapons explosions is concentrating in the northern hemisphere over the earth's major population belt. Rain and snow hasten fallout, tending to concentrate it in food and milk producing areas.

Dr Merril Eisenbud, on leave from AEC's health and safety laboratory, said strontium 90 in milk sampled in New York State has increased, but that he would not hesitate to let his child drink such milk. He described "discrimination factors" which work against absorption of strontium in the body.

Plants discriminate in favor of calcium (similar to strontium chemically). If a cow eats the plant, there is further discrimination in making milk. If a human drinks the milk, there is another discrimination in favor of calcium. The amount of strontium finding its way into the body, therefore, is considerably smaller than the amount originally deposited. It is smaller in the case of milk than in vegetables.



MERRIL EISENBUD, on leave from AEC's health and safety lab, said Americans will get far less strontium 90 from bomb tests than from natural causes. Chart shows cumulative millicuries per sq mi of Sr 90, estimated from June, 1956 data

NUCLEAR NOTES

Potential danger of Power Reactor Development Co's fast breeder is still being underscored by A. D. Rogers and C. Rogers McCullough, both of whom are members of AEC's advisory committee on reactor safeguards. McCullough said no evidence has been produced to demonstrate there could be no explosion or that such an explosion could be contained safely.

Cost of Northern States Power Co's proposed boiling water reactor (EW, Feb. 18, p 66) is estimated now at $21 million for a 66-Mw plant. NSPC, representing ten other Midwest utilities, has submitted a formal proposal to AEC for sanction of the project.

Nuclear research is to get another boost from private interests as General Electric Co attacks development of boiling water power reactor, study of radioactive materials, and experiments in physics at its new $10-million Vallecitos Atomic Laboratory recently completed near Pleasanton, Calif.

No Union Wanted

Engineers and technicians of Minneapolis-Honeywell Regulator Co's Minneapolis plant have voted strongly against union affiliation. In a representation election held May 8 by the National Labor Relations Board these points were put on the ballot:

1. Representation through United Auto Workers, AFL-CIO. Results: 314 engineers for, 254 technicians for.

2. Representation through Engineers & Scientists of America (the bargaining agent for ten years). Results: 197 engineers for, 62 technicians for.

3. No union affiliation. Results: 896 engineers for, 404 technicians for—making a total of 1300 as against 827 for a union.

4. (For engineers only) If a union is desired, should it include technicians or be a separate engineers' union? Result: 974 to 429 in favor of a separate union.

A Break in the Storm Clouds

U. S. Attorney John B. Stoddart Jr has announced that a grand jury investigation of the $35,000 Union Electric lobbying fee case failed to show any federal violation. "While available evidence indicates a questionable transaction," said Stoddart, "the facts developed do not come within the grasp of the Holding Company Act."

He said both his staff and that of the Department of Justice's criminal division felt one important link needed to show a violation was missing. "We were not able to establish legally that former State Auditor Orville E. Hodge (recipient of Union Electric's payment) was a candidate for public office when the fee was paid. It was rumored he was a candidate for governor, but this has not been firmly established," Stoddart said.

J. W. McAfee, Union Electric's president, has denied the money was intended for Hodge (EW Dec. 3, 1956, p 15).

Arc Envelops Two Men

Wisconsin Electric Power Co reports that two men have died of burns received May 16 in a Milwaukee substation accident. A preliminary investigation has not revealed the exact cause, but the company reports this may be what happened:

Two maintenance electricians at the South First Street substation were adjusting a disconnect clip on a switch of the 4-kv bus section. It appears that one was holding a flashlight while the other did the work. One accidentally touched the 4-kv circuit. This started an arc that enveloped the men. Automatic relays tripped 17 of the 29 affected light and power circuits. After the men had been cared for, incidental fires extinguished, and damage evaluated and isolated, feeders were restored singly until all load had been picked up 1 hr 25 min later.

No Old Bones This Time

It's not too unusual for utilities having fish problems to employ icthyologists. But Pacific Power & Light Co may be unique in having an archaeologist on its payroll.

He is Clayton C. Denham, a University of Washington graduate student. His object: to conduct a two-week field survey for PP&L in the Swift hydroelectric project's reservoir area to be filled late in 1958. His report: no evidence of permanent Indian camping sites in the area. His conclusion: Indians of the lower Columbia, coastal tribes, and those of inland Washington plateaus used the upper Lewis River valley as a trade route but avoided it for summer camps because of its height above the snowline.

A Lot of Thinking . . .

Santee-Cooper Authority and Central Electric Power Cooperative, Columbia, S. C., may join forces in construction of a steam plant, it has been reported. The move may be helped along by the fact that CEPC could apply for a $20-million, low-interest-rate loan from Rural Electrification Administration. Central Electric Manager E. V. Lewis says no application has been filed nor formal steps taken toward getting the loan. But he admits "we have been thinking about it." State Sen R. M. Jefferies, general manager of South Carolina Public Service (Santee-Cooper) Authority, admits he, too, has been thinking about it.

A&FP Courts a Crisis

The ANSEC group of American and Foreign Power Co subsidiaries have informed their workers that from now on they will not pay wage increases decreed Dec. 14 by the Argentine Ministry of Labor and Welfare. These increases are mandatory under a decree with the force of law, reports McGraw-Hill World News in Buenos Aires.

This move is certain to provoke a crisis. But it is ANSEC's way of bringing to a head the long-standing grievances on the government's refusal to allow rate increases.

Meanwhile, Argentina's government recently took over 50% of A&FP's distribution system in San Juan province worth about $650,000 at free-market exchange rates. This is the second such move since Peron was ousted in 1955. A small plant and distribution facilities in Cordoba province were nationalized in March.

R. E. GINNA

- They "can't afford" Cadillacs but won't heat electrically because "your rates are too high"—Swartz
- High-bill complaints may reflect customer belief private power is "dreadful monopoly"—Liversidge
- Utility "hierarchy" tends to defeat creative approaches to customer relations—O'Brien
- There's a hand in your pocket and mine—Ginna

PEA Attacks Customer Problems

"Ask a customer why he doesn't drive a Cadillac and he tells you he can't afford one. But ask him why he doesn't heat his house with electricity and he tells you that your rates are too high."

This customer attitude was being attacked by R. C. Swartz, vice president of Pennsylvania Power & Light Co.

He was one of several speakers participating in a lively conference hitting the ever-recurring customer relations problems that utilities face. The conference was sponsored recently in Hershey, Pa., by the Pennsylvania Electric Assn's Customer Contact Committee.

Swartz said one of the biggest tasks now facing private utilities is that of convincing the public that "we're not a villainous-purple power trust."

The beginnings of a good customer relations program originate in careful planning, when it's decided what the message should be. This message, he said, should have "rouse power." It should state the issues simply and make it easy for the customer to join your side.

Delegates Pop Questions

Delegates evidenced great interest in PP&L's management of customer relations which had been mentioned earlier when Swartz was introduced. They bombarded Swartz with questions after he sat down.

How does the management machinery work? Swartz said divisional vice presidents meet periodically in Allentown. They receive official communications from top management describing the philosophical approach to the customer relations problem.

They take written copies of these communications back to their divisions and hold meetings of their department heads, passing out the communications. The department heads then spread the word to their men. Even field staff meetings are held.

How do you make sure that the information you present isn't misinterpreted? Swartz said PP&L had experienced no misinterpretation to date.

Every Employee Is Important

R. P. Liversidge, vice president, Philadelphia Electric Co, said customer relations depend on the way utilities do everything—how each employee does his job. Customer relations is an element in every management decision, he said.

When someone comes in to complain of a high bill, that's the time to shower him with interest, he said, to convert a negative impression into a positive impression, to convince him that private power does not represent a "dreadful monopoly."

Utilities often can capitalize upon troubles to stimulate good customer opinion. The company's handling of an accident at its Delaware River plant, which belched a cloud of soot that settled in a populated area nearby, drew more favorable comment than criticism, he said.

N. G. Dodson, eastern division commercial manager for Pennsylvania Electric, took over the speakers stand next. His subject was the irascible customer who "finds fault with many phases of our operation and doubts our integrity."

Special Employees Needed

How do you handle this guy? Dodson suggests extra special treatment. He suggests specially trained employees who have the time to investigate the customer's complaints thoroughly. This man should:

- Be well liked and have excellent personal qualities.
- Be properly trained in "everything"—including PUC regulations and taxes.

His supervisor should sit with him periodically to review cases, to sympathize, and to guide him.

Dodson said bad customer attitudes often evolve because the customer doesn't get all the attention he believes is due him.

"Let him talk," said Dodson. "Don't interrupt him when you think you understand his problem fully. Instead be attentive, for he's apt to give you some of the answers you need."

Creative Techniques "Work"

Dr Harold J. O'Brien, associate professor of speech at Penn State University and a local expert on creative thinking, told delegates he could describe methodology that would enable utilities to develop their own answers to problems. "And believe me," he said, "it works."

R. C. SWARTZ

R. P. LIVERSIDGE

H. J. O'BRIEN

Four propositions are involved. They are:

1. In going beyond the present frontiers of thought, "we are in the realm of creative thinking—the pursuit of the unknown and unknowable."

2. Customer relations and community relations are fertile fields for creative thinking.

3. Present utility customs and tradition tend to defeat creative activity in customer and community relations.

4. "We can do something about fostering creative activity in customer and community relations in our own organizations."

Unleash "Wild Ideas"

"This kind of research calls for stabs in the dark, for wild ideas, for a jet-propelled attitude toward ideation, and for imaginative new approaches," he said, citing how Nylon, ethyl, and tubeless tires, were created through wild ideas.

The creative approach can help utilities, but present customs tend to defeat creative thinking in utilities. Utility management is a hierarchy, he said. It has "top management," and just as surely a bottom, too, and places in between the two extremes.

"The typical fellow who gazes to the top . . . is seeking approval. He wants to be well thought of. Is it logical for one in such a position to shoot wild with ideas, to make tentative stabs?

"No indeed. He tends to remain quiet. This keeps him from losing status at least. He learns how not to upset staff tranquility by advancing any supersonic thought."

There's little chance that any real creativity will emerge from conferences, Dr O'Brien said. Conferences primarily are critical in nature. They offer an excellent way of refining an idea, of getting at facts. But they're poisonous to creative thought, he said.

But Dr O'Brien said utility management could do something toward fostering creative thought. First, one should cultivate creativity in oneself. "Being blessed" and formal education have little to do with creativity. Age and sex have nothing to do with it, he said. But application of the following techniques do:

- Locate the problem in community relations. Define it sharply.
- Steep yourself in its lore, its background, and even the irrelevant information.
- Organize the lore so it is easy to find what you need.
- Isolate the nuggets, for somewhere in this lore lie the crucial points that will bear on the solution. Isolate all the nuggets and fit them into new relationships. Write down these new relationships, or the new thoughts that emerge.
- Let the ideas hatch. Let the subconscious take over in its own mystical way. The way the subconscious works is not really known. But this period, he said, is a time which "if the mind is sufficiently steeped in the lore . . . new ideas take precedence over the old order."
- The idea is born—often at an unexpected time or an undisciplined moment—while shaving, for instance.
- Adapt the idea to the work situation, reworking it if neccessary to sell it to the boss.

Earlier in the meeting, R. E. Ginna, president of Rochester Gas & Electric Corp, handed out copies of his official talk, "Your Stake in Public and Private Power," then spoke on an unofficial subject, "The Hand in Your Pocket."

After the U. S. had made its treaty with Canada, in which Congress reserved the right to determine who would develop Niagara power, the five New York State utilities banded together and said "we'd do the job," he said.

At that time, he said, cost of the project was estimated at $400 million. For six years, he has been trying to win Congressional authorization for the project proposed by the private group, he said. Today the same project would cost $600 million, he said.

Ginna decried the pending Clark bill, saying it has "all the evils of public power" in its federal preference clause.

If the Clark bill should pass, then the 97% of New York State served by private power companies will be "left out in the cold." The pending Ives-Javits bill, which eliminates the absolute preference of the Clark bill, would give RG&E its share of Niagara power.

Beating Absolute Preference

Ginna said the New York group doesn't want public power, but if it can beat down the absolute preference clause, "we will have slowed down the invasion of the power field by social planners."

L. J. Lewis, chairman of the meeting, said the conference had attracted a record attendance this year of 130 persons representing 13 companies which serve about 95% of Pennsylvania's electric customers.

ECNE EXECS in a between-sessions breather. L to r, William Webster, Yankee Atomic Electric Co, Sherman R. Knapp, president of ENCE and Connecticut L&P, and Mrs. Knapp

ECNE Workshop: Lesson in Cooperation

Electric Council of New England holds first Sales Division meeting, stressing lighting, heating, commercial cooking and A-power

The year-old Electric Council of New England provides a lesson in cooperation and unanimity for the industry. Its recent two-day Sales Division workshop held at Wentworth-by-the-Sea, N. H., was a well organized and profitable get-together. To begin, the Electric Council, or ECNE as it is known, has as its members *all* 48 operating companies in New England—a feat in itself! It was organized to interchange technical and operating information among members.

Connecticut Light & Power Co's Sherman Knapp is ECNE's president; the board is composed of member-company presidents. Capt. H. A. Ingram (USN-Ret.) is executive director. Sales Division is piloted by New England Electric System vp C. D. Lawrence.

The workshop was kicked off with parallel sessions on lighting and commercial-industrial sales. Central Maine Power Co's Roland Hess and R. D. McFarland outlined their company's lighting promotion program. The trend to higher lighting levels, especially in office and industrial spaces was described by J. M. Ketch of General Electric's Nela Park. According to Ketch, the industry is now "competing with the sun", from a ft-candle level consideration. Utilities must again regard lighting as they did prior to World War II: as a primary load builder and not as a stepchild.

Electric Heat Spotlighted

How to put more electric heating on the lines was set down by guest speaker J. H. K. Shanahan of Indiana & Michigan Electric Co. He was invited to address the New England group on his highly successful electric heat program. The increasing attractiveness of electric heating for schools was stressed by C. F. Kreiser of Edwin L. Wiegand Co.

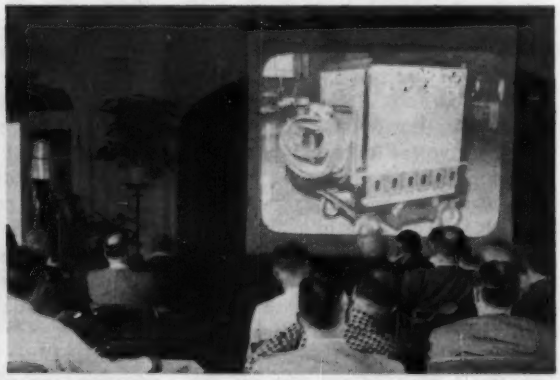
Highlight of the first day's proceedings was an outline to the sales people of the thinking and planning going into New England's first nuclear power plant by William Webster, president of Yankee Atomic Electric Co. Webster went on to tell of the promises that nuclear power holds New England, especially that of for equalizing its power costs with those of other areas.

President Sherman Knapp, in an after-dinner speech, both welcomed and congratulated company representatives.

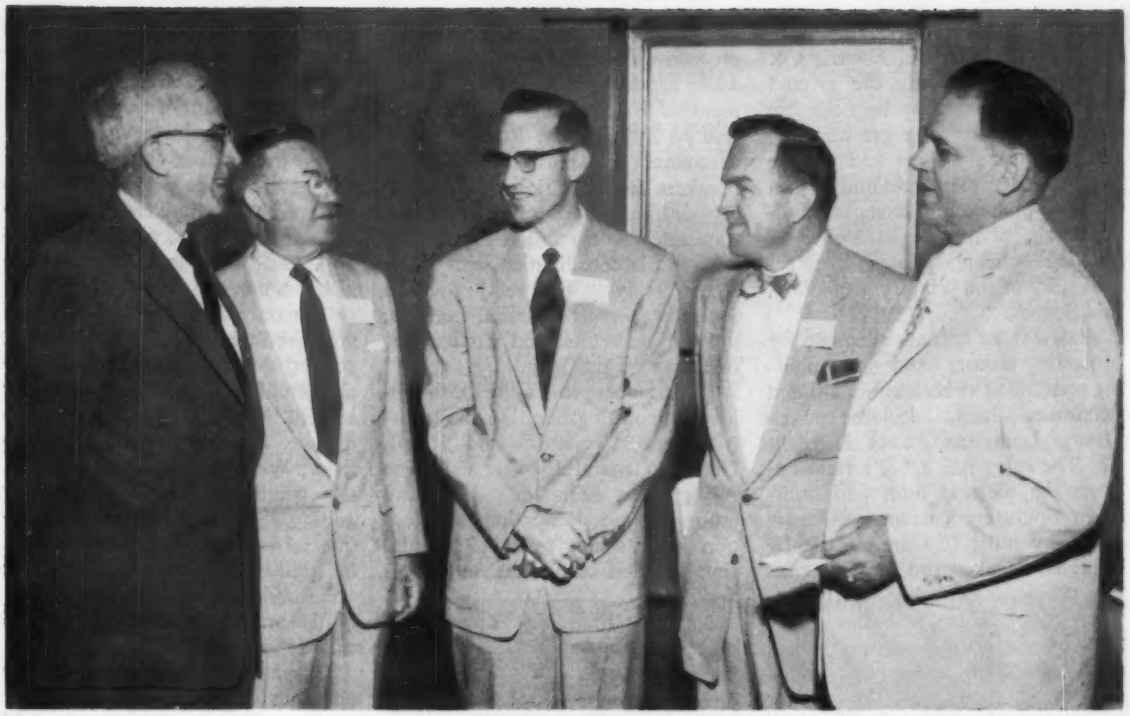
Second day was devoted to parallel sessions also, with the spotlight on commercial cooking and industrial heating applications. Equipment and commercial kitchen design were stressed. There was also panel discussions on the benefits of the Certified Lighting program to New Englanders.

Much of what came out of this first ECNE sales meeting is not new to the industry. Perhaps the most significant aspect was the singleness of direction and purpose its members exhibited. ECNE, though still very young, provides a model of an association devoted to its members and the area they serve.

SALES DIV CHIEFS: l to r, J. B. Mitchell, BV G&E, C. D. Lawrence, NEES, A. M. Wade, CL&P, and A. L. Bisbee, HEL



INDUSTRIAL HEATING GROUP listens to General Electric engineer L. S. Cooke lecture on infra-red applications



C. P. ALMON, JR Tennessee Valley Authority; E. B. Henry, Gulf Power Co; Jerry Vandegrift, Alabama Power Co; G. C. Kelley and C. W. Cogburn, both of Florida Power & Light Co, were among speakers at relay conference

Relay Men Hear Load Shedding Approved

Georgia Tech conference in Atlanta is told TVA findings with procedure for maximizing system service continuity

Experience with load shedding has proved the procedure's soundness, the Georgia Institute of Technology Protective Relaying Conference was told May 9-10, in Atlanta, Ga. Operating philosophy is that it is preferable to interrupt some load briefly during disturbances than to attempt to supply all load and risk interruption of a larger part of the system for a longer time, said C. P. Almon, Tennessee Valley Authority.

TVA uses several relaying schemes for load shedding during disturbances, he said. From generating plants, loads as large as 250 Mw on radial lines are cut off. At industries, underfrequency relays are installed on selected breakers to interrupt power other than that for auxiliaries or for critical processes. The relays trip at 58.5 cycles and restore load automatically at a preset frequency after a definite time or manually at any time. Other loads are cut off manually upon request of the power dispatcher or by standing orders.

Each Relay Opens Feeder

Almon said that admittance-type distance relays with carrier pilot relaying and fast reclosing minimize the need for load shedding. The relaying scheme discriminates between line faults and line overloads. Addition of a timing device to discriminate between tripping for line faults and for instability prevents reclosing when it would be not only ineffective but could compound the disturbance.

Proper application of underfrequency relays prevents a complete system shutdown during system disturbances and speeds load recovery, stated C. W. Cogburn and G. C. Kelley, Florida Power & Light Co. Such relays, having about 6 cycles overall operating time, could be applied to tie lines, generating plants, and bused and tapped load substations.

Each underfrequency relay set for operation at one of several different frequencies opens a substation feeder in accordance with a priority rating for continuity of service. Load interrupted by operation of underfrequency relays can be restored manually for simplicity and reliability, they said.

During the turbine-generator rotor pre-warming period, the harmonic-restraint transformer differential relay and the ground overvoltage relay are the only ones that do not provide complete protection. High-sensitivity tuned circuits in these relays provide optimum performance at normal frequencies and less sensitivity at lower frequencies. Thus, supplementary relay units are

required during pre-warming, said D. B. Brandt, General Electric Co.

Supplementing only the ground overvoltage relay may be desirable on the basis that the pre-warming period is usually short and voltage low, so that the probability of a phase-to-phase fault is slight. This approach, simplifying the overall relaying scheme, does not affect reliability of the primary protection, said Brandt.

A new relay appears adequate for protecting motors from single-phasing conditions at both minimum and maximum load, declared Jack Davey, Louisiana Power & Light Co. The relay has a 10/1 ratio between its thermal limit and minimum operating current. Because the relay must trip an electrically operated breaker and requires control power, it probably will be applied for large and important motors. In critical process plants, it can be connected to the motor voltage bus to trip the master breaker serving the bus when the transformer starts to single phase.

Davey urged consultants to design industrial facilities that are as reliable as a utility's, particularly for continuous processes. He cited an industrial firm which spent thousands to correct poor design.

Checking industrial customers' protective equipment proves worthwhile for Jacksonville, Fla. Department of Electric & Water Utlities, said A. H. Pillsbury. Relay division personnel check current circuits and breakers for operation. Relays are set with appropriate pickups and time settings in relation to installed load and in coordination with utility feeder relays. The relay division found breakers that could not trip, open trip circuits, and current trip or relays set too high.

Experience proves the desirability of neutral grounding of industrial power systems, said H. B. Greear, General Electric Co. The two greatest gains through neutral grounding are elimination or reduction of transient overvoltages and simplification of ground fault location.

Neutral grounding also reduces operating and maintenance expense and improves lightning and fault protection, system reliability, and safety for personnel.

Relaying Not Economical

Regular inspection and replacement of failed units in large capacitor banks, having a numerous series sections per phase, is the best way to protect against section overvoltages. For this protection, economical relaying schemes cannot be relied on, said H. H. Leech, Tennessee Valley Authority. The only really reliable relaying approach is to trip the breaker when the section voltage exceeds its permissible voltage-vs-time limit by using a voltage-sensitive device across each section. But this scheme does not appear economical.

The only practical possibility of undesired tripping with a 90-60-deg connection of single-phase directional units occurs when the relay current is predominantly zero sequence. But, declared G. D. Rockefeller, Westinghouse Electric Corp, this condition can be handled by adding CTs to filter out zero-sequence current. Other conditions, he said, could conceivably cause undesired tripping; but these possibilities are remote as proved by field experience.

Graphs and templets expedite the planning of distribution protective equipment coordination, said Wayne Burch, Carolina Power & Light Co. The graphs consist of impedance diagrams and study sheets. Templets are made for impedances of each size conductor and for the time-current characteristics of various protective devices.

PEA Told Small Nozzles Do Better

Equipment group at Pittsburgh hears small-nozzle layout generally costs less when water pressure is sufficient

Small nozzles generally do a better job than large ones in water spray systems for transformer fire protection. This was the substance of a dissertation on the relative merits of each at the May 9-10 meeting of Pennsylvania Electric Association's Electrical Equipment Committee in Pittsburgh, Pa.

E. P. Denigan, Blaw-Knox Co, explained that a large-nozzle system has the advantages of fewer nozzles and more simplified piping than a comparable small-nozzle system. This results in lower cost, improved appearance, and simpler removal of the transformer.

Small Less Expensive

But these advantages apply only where the inherent station design affords sufficient water pressure. When more pumping capacity is needed, a small-nozzle layout is generally less expensive.

Small-nozzle systems, operating at lower water pressure, can be installed closer to the transformer. Fire tests have shown, Denigan said, that a strong wind blowing toward nozzles distant from the transformer makes it unusually difficult to put out the fire. The same occurs where nozzles discharge downward through the fire's updraft.

As an example, Denigan compared water spray systems for a 3-phase, 175,000-kva, 230/17-kv transformer of the forced oil water type. Fire protection would require either (1) six large nozzles at 125-lb pressure and 650-gpm total discharge, or (2) 47 small nozzles at 30-lb pressure and 800-gpm total discharge. Pressure difference often decides the case.

Four or six large nozzles usually cannot provide total water coverage of a transformer with obstructions such as coolers, tap changers, and

control boxes. Increasing the system to a sufficient number of large nozzles, however, might severely strain the water supply.

Tests have proved that large nozzles can extinguish fire on top of the transformer case. But fires along the sides, such as might result from a ruptured cooler, resist extinguishment by large-nozzle systems, particularly on a windy day, Denigan said.

Asserting that he was not presenting a case against large-nozzle systems, Denigan made this summation: "There are some types of installations where a large-nozzle system will do as good a job as the smaller nozzles, but these cases are in the minority and can be served equally as well, all things considered, by the small-nozzle layout."

Pressurized by Nitrogen

But sufficient water is not always available at the required pressures, even for small nozzle systems. A solution to this problem was described by J. A. McGuckin, Philadelphia Electric Co. This company uses a stored water supply, pressurized by nitrogen, to protect three 10,000-kva, 66/33-kv transformers, each enclosed on three sides by a brick wall.

A 40 by 40-ft valve room adjacent to the control room houses a 1,000-gal water tank for each transformer. The water is discharged automatically by a bank of six 50-lb bottles of nitrogen as the expelling agent. This system develops about 85-lb pressure in the tanks and 40 to 45 lb at the nozzles. Each tank provides water for slightly over 2 min.

Explains Cure for Microwave Fading

- **Communications group at Canton told frequency diversity is the cure**
- **Microwave found less expensive on system than correcting carrier for voice in wet weather**

Critical distance for microwave links is debated by Henry Magnuski, Motorola, and F. L. Greene, Ohio Power, PEA Communications Chairman C. E. Newhard listens

Frequency diversity is the cure for microwave fading on links of 20 to 30 miles, Motorola's Henry Magnuski told the Pennsylvania Electric Associations Communications Committee last month at its Canton, Ohio, meeting.

Fading, he said, is caused by phase cancellation of beams split into paths of dissimilar lengths by atmospheric conditions. Use of dual frequencies, separated by the ratio of 4 or 5 to 1, overcomes fading as widely different frequencies are not cancelled simultaneously by the same atmospheric disturbances. Magnuski suggested that electric utilities seek permission to apply this remedy. The problem is most acute for paths traversing flat or humid terrain, he continued, noting that fadeouts endure only a few minutes per year and never occur during storms.

Microwave is difficult to justify for one or two channels, reported F. L. Greene, Ohio Power, unless it provides special advantages such as high reliability. He described the expanding American G&E communication system which today includes $300,000 of microwave with links of 4.7 to 35 miles. Fading has been troublesome on only two links of 24.5 and 25 miles, he said.

Experience with this system has shown that as many as 60 channels would be desirable, Greene continued. Voice transmission has proved acceptable with bandwidth limited to about 2,700 cps. A similar channel is expected to accommodate a facsimile link or 18 telemeters.

Microwave was provided for Ohio Valley Electric's 345-kv system because it cost less than correcting the carrier for satisfactory voice communication during wet weather. But the carrier system has adequate margin for protective relaying, he said.

Old Quarry

- **British convert quarry to unique station for test of transmission structures**
- **150-ft vertical walls are ideal for windless horizontal loading to 30 tons**

This transmission tower is being tested under close to ideal conditions—in an abandoned quarry.

The British hit on this unique solution to the problem of testing tall structures. And the old quarry's four 150-ft vertical walls and 60 by 100-ft floor meet four major specifications:

1. Towers can be tested in virtually still air conditions.

2. Horizontal loads can be supported at the structure height.

3. In destruction tests, horizontal loads up to 30 tons can be anchored to supports stronger than the structure.

4. Two or more horizontal loads can be applied at right angles.

The tube manufacturing firm, Stewarts and Lloyds, Ltd., set up the testing station recently at Derbyshire, England, for use in developing tubular structures. Other interested manufacturers and users are given access to the site.

A universal type of base has been constructed to accommodate a large variety of towers. Bolts can be screwed into sockets flush with the concrete base, and the tower footings can then be picked up at the required point.

Walls Solve Big Problem

The high walls permit application of loads equivalent to wind loads without having to allow for the wind itself. This is a major problem at other testing stations because in bad weather it is impossible to apply heavy wind loads without danger of accidental overloading.

When a tower taller than 100 ft is tested, ropes can be carried to the rising ground around the quarry; or small structures can be erected to enable horizontal pulls to be applied up to 200 ft above the quarry floor. Higher structures can be tested by dealing only with the top

Transformed to Tower Test Site

part, or by using half-scale models. Maximum width across the cross-arms is limited to 50 ft for towers up to 100 ft high. Above this height the width can be considerably greater.

Loads up to 30 tons are required for some tests, so the anchorage points must be very secure. After a number of tests, the type of anchor selected was capable of withstanding a direct pull of 94 tons. At this point the eye of the anchor broke, but there was no sign of the anchor itself being disturbed in its rock setting.

In very few cases will the load be applied in such a way as to pull an anchor straight out of the rock. Normally, the anchors will carry a pulley converting the vertical load into a horizontal one, and the resultant pull will be at 45 deg or less to the line of the anchor.

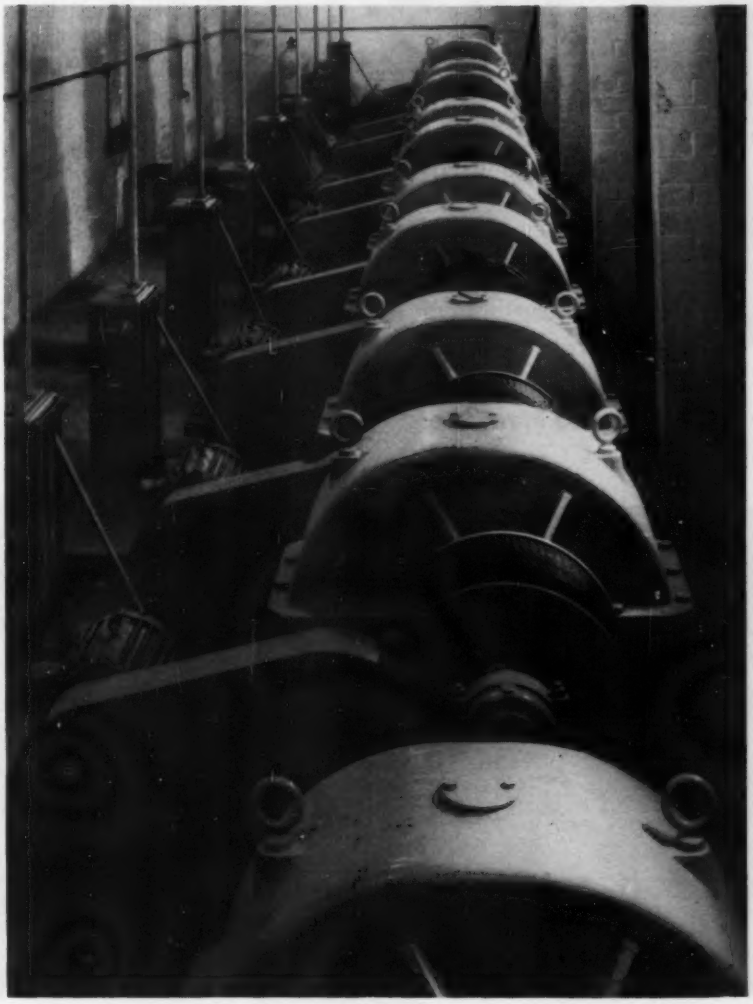
The number of these anchor points will increase as various tests call for them. Eventually there will be sufficient anchors to allow any structure to be picked up, if not exactly at the right level, then by a bridle spanning two anchors.

12 Loading Points Chosen

The number of loading points and the maximum load at any one point were problems given much consideration. It was finally decided that 12 points would be needed, and that the load at any one point would not exceed 30 tons. This could best be obtained by a 5-ton pull, multiplied by the usual arrangement of multi-sheave blocks.

Ordinary commercial winches were not suitable, as the tests would need a large load applied very slowly—the opposite of the usual winch application. Special gears were provided to keep the rope speed very low, about 1¼ ft per min. Each of the 12 winches is powered by a 2-hp motor running at 960 rpm. The main drum makes only ½ rpm. Maximum load per winch is 5 tons.

If more than 12 loading points are required, one winch can serve several points at the same time. Loads in excess of 30 tons can be obtained by coupling a number of winches and anchor points together.



12 SPECIAL WINCHES can each apply 5-ton loads at speeds as low as 1¼ ft per min. Coupling several winches together can give loads in excess of 30 tons

The building which houses the winches and switchgear extends across the end wall opposite the entrance. The control house is immediately above it. Sloping windows of armour plate glass, provided for observation, give a clear view of the test area. The winches are under push button control, both at the winch itself and remotely in the control house.

The main control desk has two wings, each controlling six winches. Load is measured at 12 points and deflection at 10 points on the structure under test.

The whole sequence of operations, the commands given, and the values of the loads applied can be registered on a tape recorder.

Ample facilities are provided for visitors to witness the test procedure. An excellent view of the tests can be had from a hut on the bridge spanning the entrance to the quarry about 145 ft above the floor. In the hut are a "stage-of-test" indicator and a loudspeaker to relay information from the control house.

To obviate any danger from falling stones, 15-ft-wide nets ring the quarry walls at a height of 50 ft.

Remote Control Shuts Down

- **Chief problems were in bringing units to standstill and keeping them there and keeping bulk of oil in receiver of governing system**
- **Air cylinders were installed on brakes to stop units by remote control**
- **Oil was locked in receivers**

N. R. FITCH, Engineer, Mechanical Section Engineering Department, Northern States Power Co, Minneapolis, Minn.

Bringing hydro units to standstill and keeping them there, and retaining oil in the governor system receiver were problems Northern States Power Co faced recently when it installed remote shut-down controls on its 3,000-kw Apple River plant.

The problems were solved by:

1. Replacing manual control of the friction brakes mounted on the shaft between the turbine and generator with solenoid-actuated air-cylinder controls.

2. Installing solenoid-actuated, air-operated, diaphragm valves in the oil lines between the governor and the receiver.

The Apple River plant has four, 750-kw, horizontal Francis turbines. It is now remotely controlled from the Stillwater plant 10 miles away.

Brakes had been installed previously on the first two units of this hydro plant because wicket-gate leakage was sufficient to prevent the units from coming to rest after shut-down. If the units were not brought

Fig 1-Schematic for Brake Control Circuit

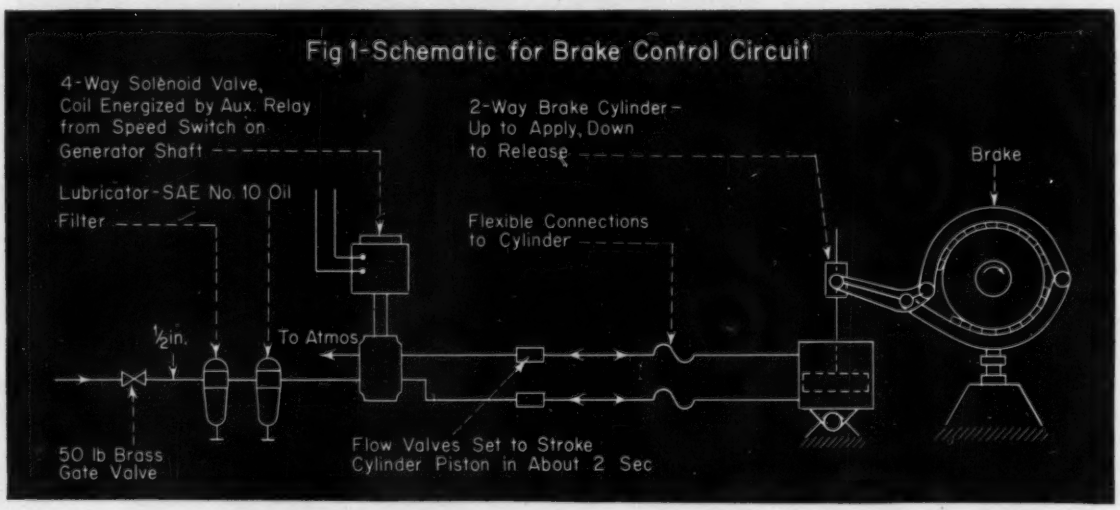
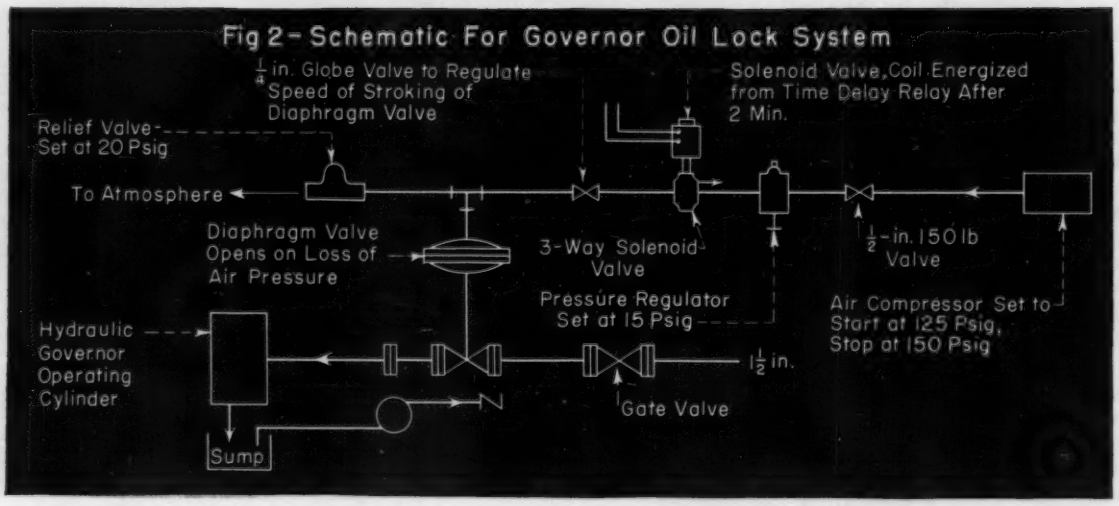

4-Way Solenoid Valve, Coil Energized by Aux. Relay from Speed Switch on Generator Shaft
2-Way Brake Cylinder - Up to Apply, Down to Release
Brake
Lubricator-SAE No. 10 Oil
Filter
Flexible Connections to Cylinder
½in.
To Atmos
50 lb Brass Gate Valve
Flow Valves Set to Stroke Cylinder Piston in About 2 Sec

Fig 2-Schematic For Governor Oil Lock System


¼ in. Globe Valve to Regulate Speed of Stroking of Diaphragm Valve
Solenoid Valve, Coil Energized from Time Delay Relay After 2 Min.
Relief Valve - Set at 20 Psig
To Atmosphere
Diaphragm Valve Opens on Loss of Air Pressure
3-Way Solenoid Valve
½-in. 150 lb Valve
Pressure Regulator Set at 15 Psig
Air Compressor Set to Start at 125 Psig, Stop at 150 Psig
Hydraulic Governor Operating Cylinder
½ in.
Gate Valve
Sump

to rest and kept there, the bearings could be under lubricated at low speed.

It was considered necessary to restrain the bulk of the oil in the receiver of the governor system from draining back into the system after shutdown to prevent overflow on the floor. Loss of governing oil pressure would cause a delay in starting until the pressure was restored.

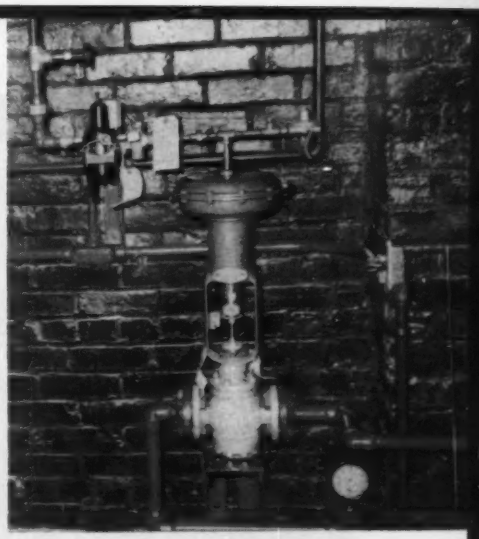
The friction brakes mounted on Units No. 1 & 2 had been applied manually by means of a screw and nut through a hand wheel.

Double acting air cylinders of six-in. dia and 3-in. stroke were installed for the new remote shutdown facilities. The diameter and stroke of the cylinder were determined by measurements and calculations to furnish enough force to bring the units to a stop quickly. Compressed air is furnished by a station service type of two-stage air compressor.

The cylinders are actuated by 4-way solenoid valves. After the gate limit switch is closed an underspeed switch on the generator shaft energizes the solenoid valve coil causing air to be applied to the underside of the air cylinder piston. The upward stroke of the piston applies the brakes. The brakes are released by the opening of a knife switch in the brake circuit which de-energizes the solenoid valve coil. This causes air to be applied above the piston, and the air strokes the piston downward.

The air cylinders have air cushions, top and bottom. To control further the speed of stroking, there are adjustable devices in the ½-in. lines to each side of the cylinder pistons. They allow free air flow to the cylinders but throttle the air flow from the cylinders.

Installation of solenoid-actuated, air-operated, diaphragm valves in the oil lines between the receivers and the governors solved the problem of locking the oil in the receivers of the governing system after the units have come to rest.



DIAPHRAGM VALVE receives air from system upon signal from controls and then closes and locks oil in receiver

Oil Pump Maintains Pressure

The diaphragm valves are fitted with "O" rings for tight seating. The operating pressure of the governing systems, controlled by the setting of internal spring-loaded bypass valves, is 225 and 200 psig for Units No. 1 and 2, respectively. This pressure is maintained by the oil pump until the unit comes to rest and drops fairly rapidly after the units come to rest.

The knife switch on the brake circuit relay panel is closed immediately after starting the unit.

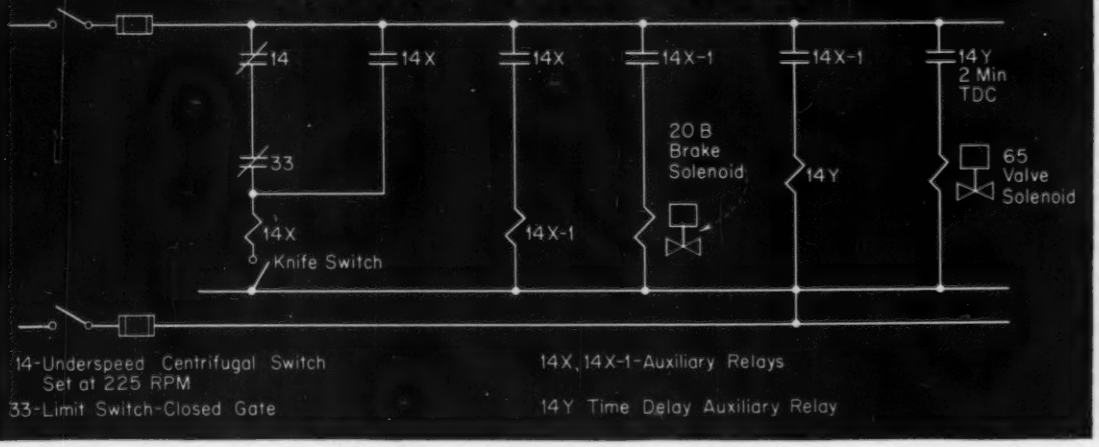
Operation on shutdown is as follows:

1. When the unit is tripped by remote control from Stillwater, the turbine gates close, and the generator breaker is tripped by the "no-load gate" limit switch. When the turbine gates close to zero, limit switch 33 closes. When speed decreases to 225 rpm, speed switch 14 closes. Auxiliary relay 14X is energized by these two contacts. It seals itself in and energizes auxiliary relay 14X-1. Auxiliary relay 14X-1 energizes the brake solenoid, 20B, and time delay relay 14Y. The brake solenoid operates a 4-way valve which admits air to the cylinder to apply the brake.

For No. 1 generator the brake solenoid is energized 10 sec after the unit is tripped by remote control and after another 10 sec the brake stops the unit. The brake remains

(*Continued on page* 152)

Fig 3-Relay Control for Remote Shutdown



WATTHOUR ACCURACY is guarded at Public Service Co of New Mexico with a specially designed precision watthour meter (left), photoelectric tester and counter (center), and a laboratory-type wattmeter of 0.1% accuracy

Design Efficiency into Precision

- **Instrument is self-checking through interchecks taken at low cost; stable operation eliminates frequent checks**
- **Data from ± 1,000 count gives values closer to wattmeter accuracy; standard deviation is 0.03% over 3 years**

E. D. KIPP, Meter Superintendent, Public Service Co of New Mexico, Albuquerque.

Efficiency and high accuracy have been designed into a three-unit precision watthour meter by Public Service Co of New Mexico for the calibration of portable rotating standards. The laboratory instrument offers an approach, through the use of the normal frequency distribution curve and its associated values, to evaluation of the inherent random errors in watthour meters. This approach is used to evaluate the performance of the precision watthour meter itself, as well as working standards and general laboratory procedures involving the random error of rotating meters.

Heart of the precision watthour meter is three rotating standard units, from which the average or mean value of indications is used to establish a higher order of accuracy. To build these units, it was decided to start with the already highly developed rotating standard. The three units were assembled from parts of a commercially available make of standard. High accuracy and precision required modification of some parts. Design and building of these parts were accomplished in the company meter shop.

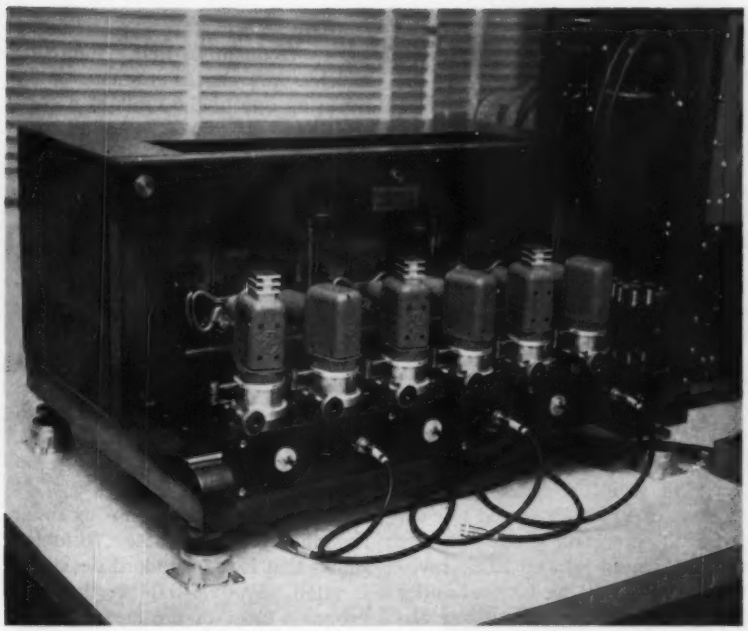
Rubies Give Minimum Friction

Basically, each unit must have a high order of repeatability. This excludes multi-range current and voltage features within the electromagnets. The desirability of the absolute minimum of friction on moving elements excluded use of gear trains. Additional ruby jewels are used on the top bearings. The shaft of the moving element carries only a pointer.

Care in assembling the units was essential. Filister screws were replaced with socket hexagonal-head screws so that a wrench could facilitate a uniform pull-up on component parts. The three units are attached at two points per unit to a common stage.

The three units are housed in a specially built walnut case which provides 2 in. of insulation (Vermiculite) in all spaces except the window. The windows consist of two pieces of plate glass, the plane surfaces of which are separated by a ¾-in. air space. Edges are sealed with a special cement. Temperature inside the case is maintained at 39C by three 30-w resistance heaters controlled by a precision thermostat.

A pull-out compartment is filled with small bags of silica gel to maintain low humidity within the case. The compartment fits into a special hatch which provides a seal when the compartment is inserted into the case. Horizontal and transverse bubble levels mounted on the stage of the instrument are leveled through adjustable leveling screws on the footings of the case. Leveling screws, in turn, rest on Lord shock



PRECISION WATTHOUR METER consists of three portable rotating standards redesigned or modified by Public Service engineers for greater accuracy

Watthour Meter

mounts to minimize the introduction of vibration to the instrument.

Before the three-unit watthour meter was installed inside the case, it was operated, calibrated, and inspected to remove possible sources of error. The common assembly for the three units was given a temperature cycle of —15F for 36 hr, room temperature for five days, and 120F for 36 hr. Strains were tapped out carefully with a soft hammer. Then the units were energized at full load (5 amp, 120 v) and run through a stop-start cycle. A potential circuit interrupting device was made which opened the circuit for 5 of each 15 sec. This cycle was sustained for more than 10,000 interruptions. The potential circuit then was closed, and the units were left running continuously at full load for 30 days. At the end of this time, current was reduced to 2% of full load and left to idle 30 days more.

Initial calibration adjustments were made at 10 and 100% load unity power factor and 100% load 0.5 pf. They were given a running cycle of 30 days at each load and power factor. Bearings were removed and given a microscopic inspection. Finally, bearings were re-assembled under closely guarded conditions, and the units received final calibration adjustments.

Current and voltage ranges of the precision watthour meter are extended through the use of multirange, high-accuracy current and potential transformers.

A loading circuit designed and built by Public Service allows flexible loading of the instrument, as well as a source for general laboratory work. This circuit includes a loading transformer (phantom) of special design having an 8/1 ratio with a 15-v secondary and resistors to furnish up to 50 amp. The transformer capacity allows several working standards to be checked at one time. The three units are supplied with an idle load of 0.1 amp at 120 v at all times except when they are being used for calibrating purposes. The idle load maintains a uniform internal temperature of the coils and keeps bearing distribution alive.

Optimum performance of a rotating watthour standard meter, used as a primary reference instrument, may be expected when the count or control for meters under test is taken from the primary instrument as it runs under full speed of load requirements. Thus, start-stop error of the primary instrument is eliminated and transients of the circuit will have had their effects and leveled off.

This reasoning led to the design of a photoelectric tester and counters which give a 1,000-revolution count as well as the usual run of counts. It was found in this case that shutter action through holes in the disks of the moving elements was not a desirable means of actuating phototesters and counters. Instead, photo pick-off is taken at right angles to the disk shafts by reflected light. Revolution count for each of the three units is recorded on counters mounted on the upper section of the phototester panel.

Because fractions of a revolution may be read from the counters and dials of instruments, values of percentages to three places below the point may be obtained from a 1,000-revolution count. A value in the third place below the point—1/100 of a revolution—is not significant. Discarding such values eliminates start-stop as well as certain errors due to slight load variations while calibrating or running an intercheck on the precision instrument. Thus is obtained a more accurate indication of what the instrument is doing when running as a control of start-stop for working standards under test.

Accurate Timing Provided

Timing for reference and other checks is derived from a 60-cycle precision frequency generator of the precision tuning fork type. Output of the generator drives a 1-rpm clock unit whose shaft is connected directly to an accurately indexed disk. This disk was perforated on an index head and laid out in seven radial bands of holes. Thus, a ratchet-spaced horizontal shift of the disk axis will cause a shutter action of these holes on a fixed beam of light at 1, 5, 10, 15, 20, 30, and 60-sec intervals. A photoelectric tube acts as a pick-off of this shutter action. The output of the tube is introduced into the phototester for start-stop counting.

A 2,000-sec count is obtained by pre-selecting a 20-sec interval on

Formulas for computing the standard deviation of the mean (σ) and the probable error of the mean (r_m)

$$\sigma = \sqrt{\frac{\Sigma d^2}{n}}$$

where d is the deviation from the mean of any individual observation, and n the number of observations

$$r_m = \frac{0.6745\,\sigma}{\sqrt{n}}$$

the shutter and a 100 count on the phototester. A 4,000-sec count is obtained by a 200 count on the phototester. With the phototester having counts of 1, 2, 4, 5, 10, 20, 100, 200, and 1,000, these two pieces of equipment provide a wide range of flexibility.

The frequency generator is checked at frequent intervals against time signals from the National Bureau of Standards' station WWV. The phototester and counters are arranged to offer any desired combination or selection. As an added precaution against error, loading circuit conditions are guarded closely by fixed conductor lengths.

The precision watthour meter is checked at intervals against a reference indicating wattmeter. A 5-amp, 120-v fixed load is impressed on this instrument for a 2,000-sec interval at unity pf, and a 4,000-sec interval at 0.5 pf.

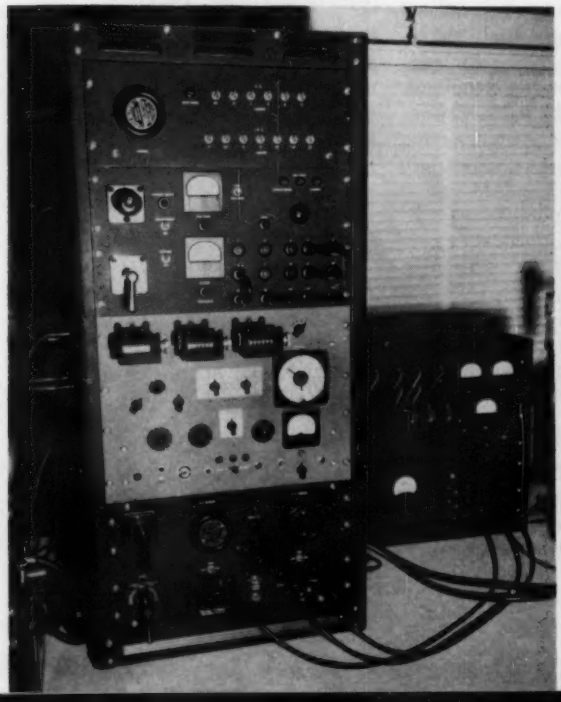
The wattmeter is a laboratory type instrument with 0.1% accuracy, full scale. A basic watthour constant of ⅓ was assigned to each unit of the precision watthour meter so that it would turn up 1,000 revolutions in a 2,000-sec interval under a 600-w load. Corrections are obtained from data drawn from the units under these conditions. The mean of each and all is used to establish the corrections because the most probable value of accuracy is represented by the mean of many observations over an extended period. The mean value of the means of the three units, of course, represents the highest order of accuracy available from the instrument.

Precision, or repeatability, is also checked by drawing off data taken from interchecks, which are made more frequently than reference checks. Interchecks are made easily by using one of the units as a control for start-stop of the other two. An accuracy of 100% is assumed for the control unit. The other two units are started from the control unit, which is running prior to the instant of start pickoff of the phototester. The intercheck operation requires only an occasional check by the operator.

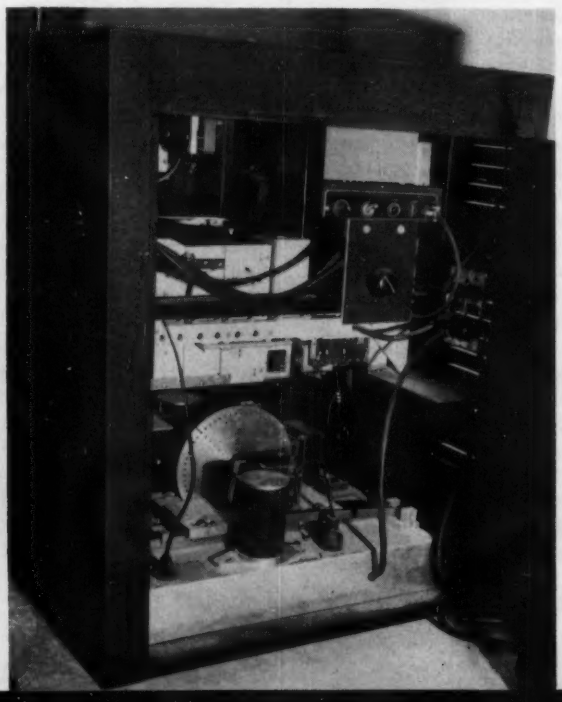
From intercheck data, as well as reference checks, the standard deviation (σ) of the mean is computed. The formula for this computation, as well as the computation for the probable error of the mean (r_m), is shown in the accompanying box. Examination of these formulas shows that if the standard deviation is small, say 0.03-0.04%, then the probable error of the mean has no practical significance. This is noted as evidence of the confidence which may be placed in the mean value of the three units. Over three years of observation has revealed a standard deviation of 0.03% for the mean of the three units. Individual performance of each of the units may be obtained by computing values of σ as outlined above.

The author acknowledges the cooperation of W. Clevenger and F. Kimble of Public Service.

PHOTOTESTER AND COUNTER give a 1,000-revolution count as well as the usual run of counts. Revolutions may be read directly from the dials of the specially designed counter

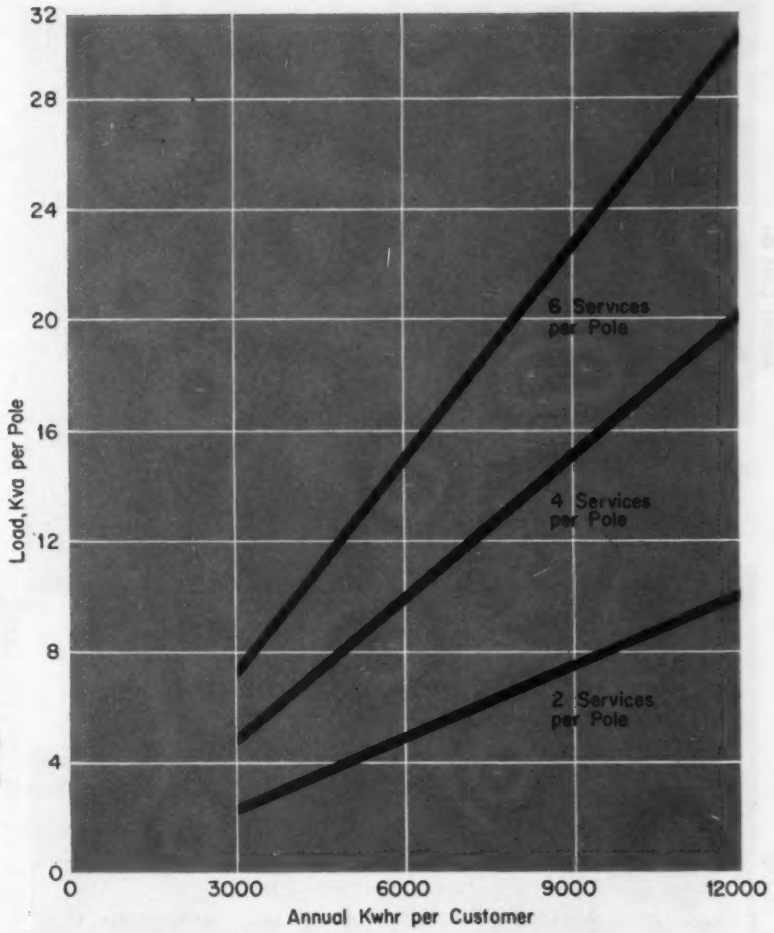


FREQUENCY GENERATOR of the precision tuning fork type provides timing for reference and checks of the precision unit. Timing from 1 to 60 sec in seven steps is available



2/0 ACSR Secondary Proves Cheaper Than 1/0

- Load growth enables 2/0 to overcome higher initial cost penalty
- Study also determines economical number of spans per transformer



1 LOAD PER POLE is related to annual kwhr per customer, assuming 30% load factor and 90% power factor. Annual residential use is 3,000 kwhr

R. H. JORDAN, Planning Engineer, Indianapolis Power & Light Co, Indianapolis.

Recent economic studies indicate that the load characteristics of new residential areas favor 2/0 ACSR as a more economical secondary than 1/0 ACSR. This conclusion was drawn from studies conducted by Indianapolis Power & Light Co to determine the economic size and length for open secondary construction on racks.

This conclusion was based on the fact that in typical new installations the higher initial cost of 2/0 is recovered within reasonable time. Savings then accrue throughout the remaining life of the conductor. The cost of material and labor for installing 1,000 ft of polyethylene-covered secondary is $246.92 for 1/0 and $281.12 for 2/0.

The study was in two sections:

1. Economic conductor size. This section dealt with the economics of 1/0 vs 2/0. The results favoring 2/0 are independent of span length because of the method of determining economic size.

2. Economic number of spans per transformer for 2/0 secondary. This section covered the economics of eliminating secondaries entirely at a particular load value. Results showed that voltage drop determines the number of spans per transformer and that secondaries could not be eliminated economically for loads less than 45 kva per pole.

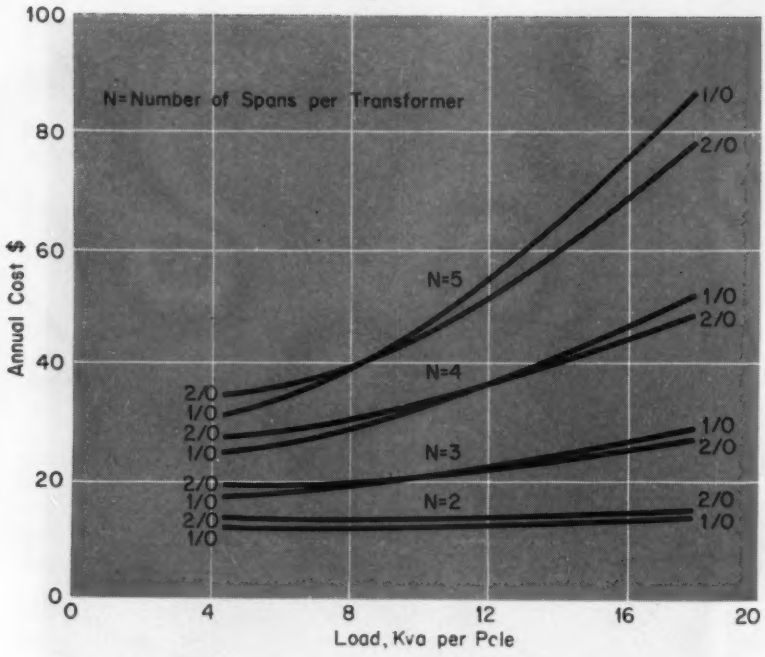
For the purposes of the study, these assumptions were made: 30% load factor and 90% power factor; $0.004 per kwhr energy charge and $115 per kw demand charge; and 15.5% annual investment charge.

In determining the economical size, the load in kva per pole was the measure of secondary loading. The accompanying diagrams illustrate (Fig 1) the relationship of the load in kva per pole and the annual kwhr usage per customer, which runs about 3,000 today; (Fig 2) the annual costs of secondary in terms of loading per pole; and (Fig 3) the number of years required to recover the initial higher cost of 2/0.

No. 1/0 is cheaper for many initial loadings (Fig 2). But, as the load grows, a point is reached where 2/0 becomes more economical. There, however, higher costs have been accumulated over the years by using 2/0 instead of the cheaper 1/0 conductors.

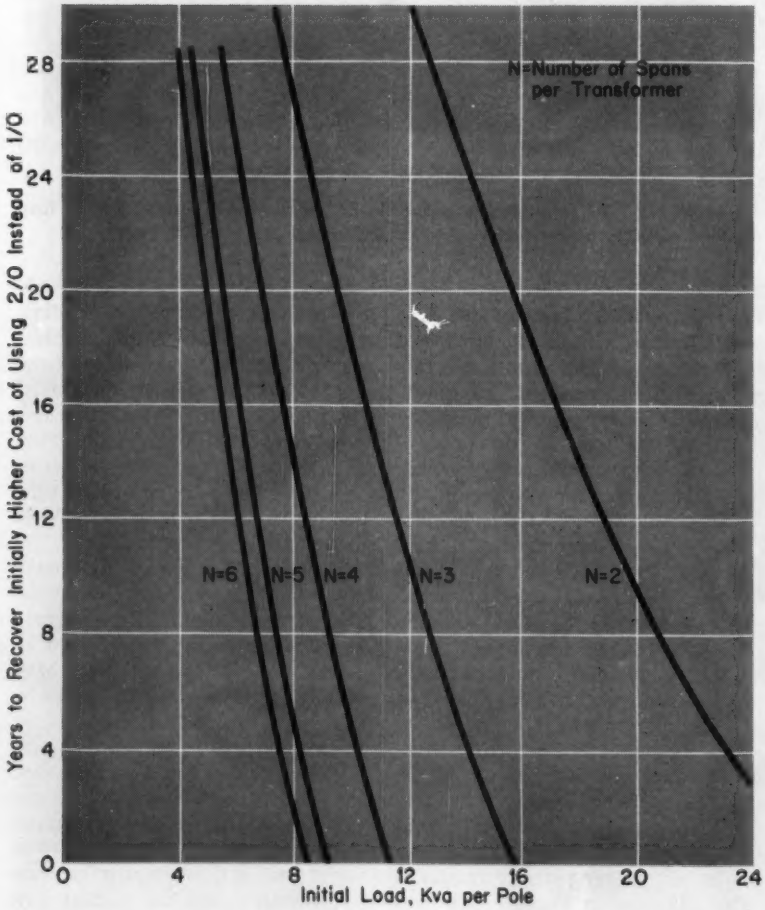
The curves of Fig 3 were plotted from a number of points, each developed in the following manner. Taking the specific case of a 10-kva initial load and four spans between transformers, first the annual cost

Fig 2



2 ANNUAL COST in terms of loading per pole shows 1/0 cheaper for many initial loadings. But with load growth 2/0 becomes more economical

Fig 3



3 YEARS REQUIRED to recover the initial higher cost of using 2/0 instead of 1/0 are shown for initial pole loadings in terms of 5% load growth

difference between 2/0 and 1/0 was derived from Fig 2. This cost difference was then converted to a time axis (Fig 4) and subsequently plotted as a point on Fig 3.

Fig 3 is based on an assumed 5% annual load growth for existing customers. Overall residential load growth may be more nearly 10% a year, but some of this represents new customers. Therefore the growth of established transformer installations will be somewhat less than 10% a year.

The annual cost difference (Fig 4) was multiplied by a 6% present-worth factor, and the results were incorporated in Fig. 5. When the sum of the ordinates of Fig 5 is zero, represented by the black area, the higher costs incurred initially by using 2/0 instead of 1/0 have just been recovered. Thus the sum of the ordinates in the remaining area represents savings from 2/0.

The accumulated present worth of the annual cost difference was charted in Fig 6. For the specific illustration shown in Figs 4, 5, and 6, the data from the following example were used.

Assume 75-ft lot sizes, 150-ft spans, four spans between transformers, 6,000-kwhr annual use per customer, and 5% annual load growth of existing customers.

With four services per pole and 6,000 kwhr annually per customer, the pole loading will be 10 kva (Fig 1). For this loading 1/0 is cheaper initially than 2/0 (Fig 2). It will take five years to recover the initial higher cost of using 2/0 (Fig 3).

Although the annual costs of 2/0 would be higher initially, the costs of the two conductors become equal after three years of load growth (Fig 4). During the next two years, enough savings are realized from 2/0 conductors to compensate for the initial higher cost of the first three years. These values represent 6% present-worth (Fig 5).

The savings from 2/0 continue to

4 ANNUAL COST DIFFERENCE for 2/0 vs 1/0 is converted to time basis, assuming 5% growth, 10-kva initial pole load, 4 spans per transformer

5 PRESENT WORTH, based on 6%, shows time needed to recover initial higher cost of 2/0, indicated by black area. Shaded area shows savings

6 ACCUMULATED PRESENT WORTH of annual cost difference in this example shows that costs became equal at 5 years and savings accrue thereafter

increase in the sixth and succeeding years. The overall result is a slightly higher cost during the first five years for the sake of greater economy after the sixth year (Fig 6).

In determining the economic number of spans per transformer for 2/0 ACSR, a span length of 140 ft was assumed. Reasonable variations in span length would not alter the results appreciably.

The life of the transformer installation was a key factor in this section of the study. The installation, including secondary, was considered as a whole unit. Because it is the practice of Indianapolis P&L to install transformers at about 90% load and change out at 150% load (a 1.67 ratio), the life of the installation becomes 10.5 years when annual load growth is 5%.

During the life of the transformer installation, some costs remain constant and others increase with the square of the load. The accumulated present worth of annual costs for the 10.5-year period may be obtained by multiplying the initial annual costs by a constant.

Thus, the accumulated present worth of annual costs for 10.5 years equals 7.62 x FC + 13.2 x GC, where FC is fixed cost and GC is the initial cost of the growing costs.

Present worth, however, reduces the 10.5 years to an equivalent of 7.6 years for the fixed costs. On the other hand, the combination of 5% load growth and present worth boosts the 10.5 years to an equivalent of 13.2 years for the growing costs, considered from the standpoint of initial costs.

The total costs were broken down into transformer cost and secondary cost. These were then examined to find the number of spans that would

Fig 4

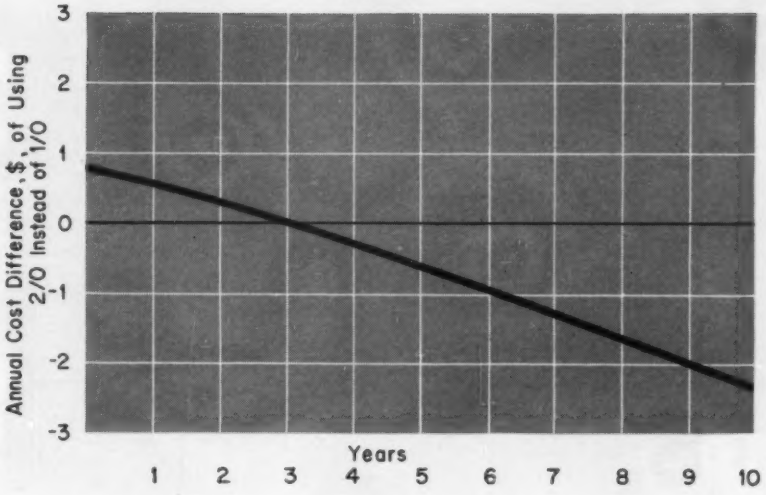


Fig 5

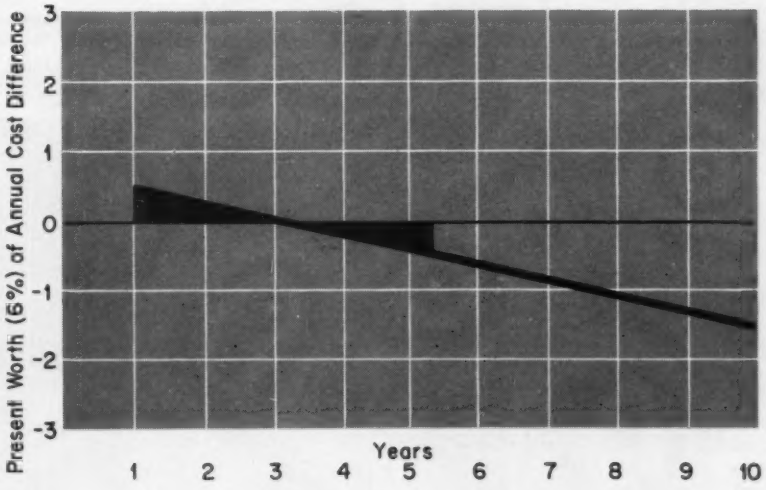
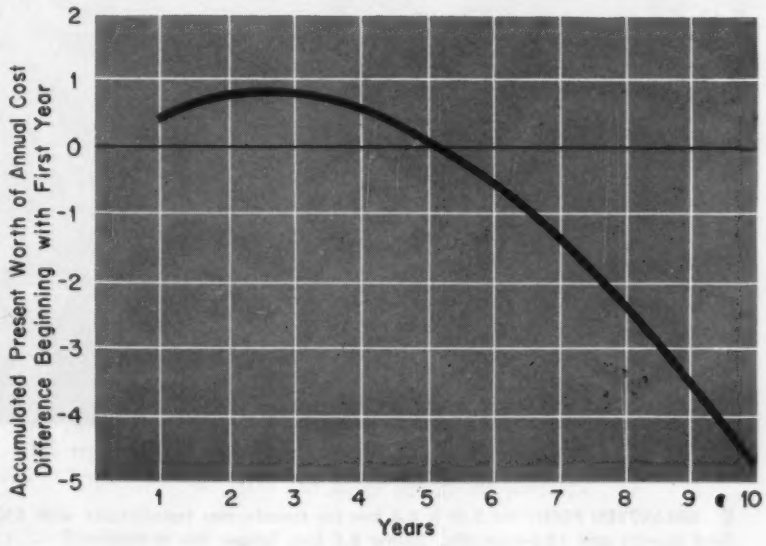
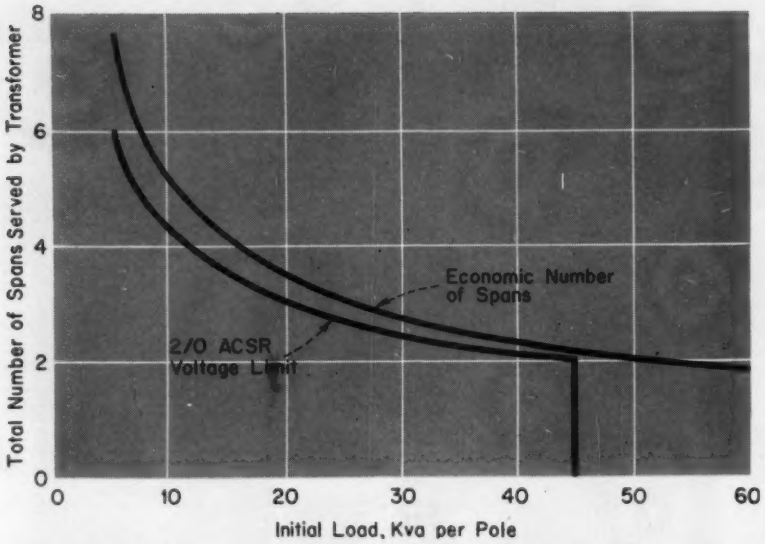
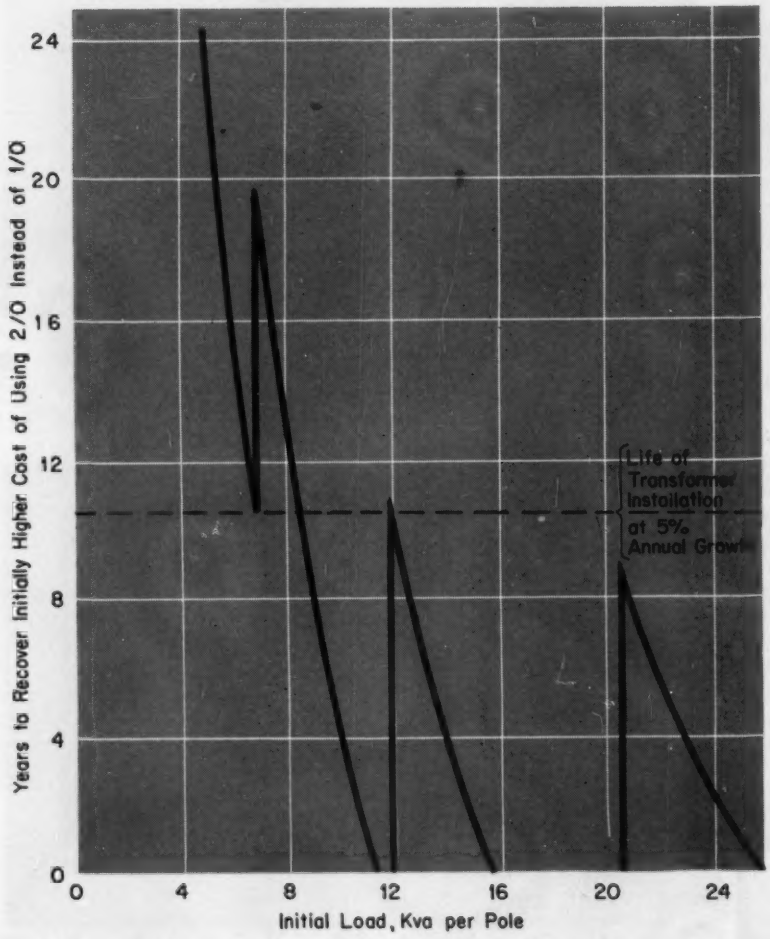


Fig 6





7 ECONOMICAL NUMBER OF SPANS agrees quite closely with the voltage limit curve for 2/0 ACSR. However, the voltage is the actual limiting factor


Years to Recover Initially Higher Cost of Using 2/0 Instead of 1/0
Life of Transformer Installation at 5% Annual Growth
Initial Load, Kva per Pole

8 BREAKEVEN POINT for 2/0 is 8.8 kva for transformer installations with 5% load growth and 10.5-year life. Below 8.8 kva, longer life is needed

give the lowest annual cost.

Transformer cost, including losses for the 10.5 years, is $97.5 \times T^{0.625}$ where T is the kva rating of the transformer and equals PN + 0.9. Here P is the initial load per pole, and N the number of spans between transformers or the number of spans served by a transformer.

Secondary cost for the 10.5 years is $46.5N + 0.01643P^2N(N^2 - 1)$.

Adding the transformer cost and secondary cost, the total cost per span becomes $104\left(\frac{P^{0.625}}{N^{0.375}}\right) + 0.01643P^2(N^2 - 1) + 46.5$. Differentiating to find the optimum number of spans leads to the following results:

$$N = \frac{19.7}{P^{0.58}}$$

This formula is plotted in Fig 7 along with the limitation imposed by voltage drop for 2/0 ACSR.

The influence of voltage drop can be pointed out by the following example. An initial loading of 2 kva per pole would require the transformer to serve a theoretical 3½ spans. However, the 3% voltage limitation at transformer changeout limits the number of spans to three. It can be seen (Fig 7) that the economical number of spans agrees quite closely with the 2/0 voltage limit. The voltage, however, is the actual limiting factor. Fig 7 also indicates that beyond 45 kva per pole the voltage drop in 2/0 would require a transformer on every pole.

For transformers with a 10.5-year life, 8.8 kva is the breakeven point. Fig 8, obtained by combining Figs 3 and 7, indicates that at initial loadings of 8.8 kva per pole and above, the initial higher cost of 2/0 is always recovered within the transformer installation's life at 10.5 years for a 5% load growth. For loadings below 8.8 kva, longer life is needed.

To determine the number of years for recovering the higher cost, Figs 3 and 7 may be used in combination. For example, with a load of 7½ kva per pole, Fig 7 shows that six spans are an economical number for service by the transformer. But the voltage limit requires less than 5 spans. Therefore, only four spans could be served by a transformer. Then, from Fig 3 with four spans and 7½ kva per pole, 17 years are needed to recover the initial higher cost of 2/0 conductor.

Kansas Gas & Electric meets high summer peaks with new 100,000-kw unit

The last decade has seen more than a tripling of Kansas Gas and Electric's load, spurred by a recent trend to much higher summer peaks. This trend began in 1954 when hot weather hit Southeastern Kansas. Due to air conditioning and other hot weather loads, K. G. & E.'s summer peak soared 26.8% higher than the previous year. Residential kilowatt-hour sales for the entire year were 29.8% greater than 1953, far more than the national average gain. This trend of rapidly increasing summer load continued at a similar rate through last year.

Kansas Gas and Electric engineers have consistently met this challenging situation by staying ahead of their requirements through forecasting and planning. Their latest step has been the addition of unit No. 3, a 100,000-kw General Electric steam turbine-generator, to K. G. & E's Murray Gill Station. By purchasing General Electric, Kansas Gas and Electric received the benefits of General Electric Power Plant Services . . . saving time, money, manpower.

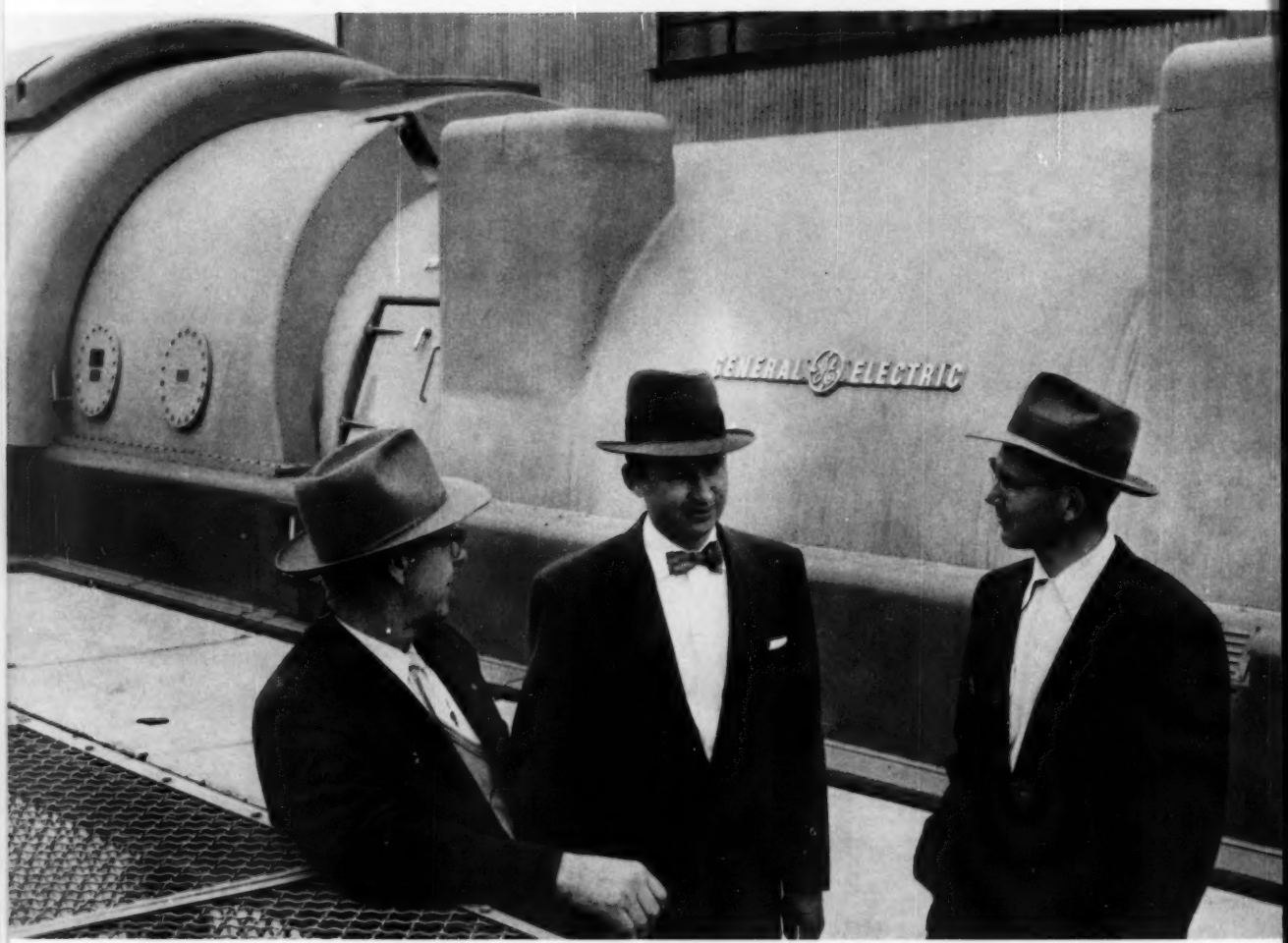
FOR MORE DATA TURN PAGE ▸

MORE POWER TO AMERICA

GENERAL ELECTRIC

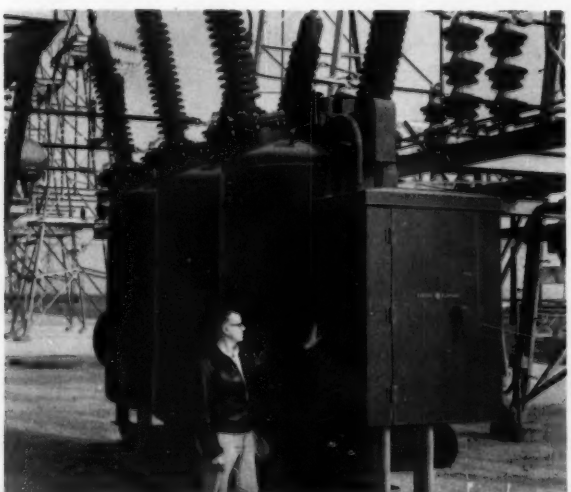
POWER PLANT SERVICES REPORT

Teamwork of

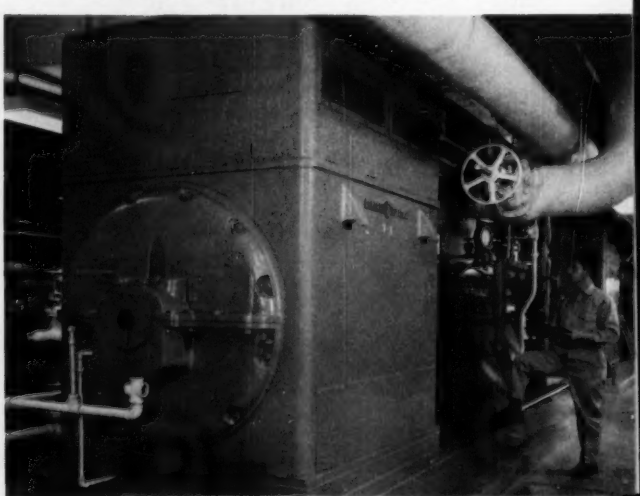


GREATER CAPABILITY to meet load growth is provided by Murray Gill Station unit No. 3, a General Electric tandem-compound, double-flow, reheat steam turbine-generator rated 100,000 kw. K. G. & E.'s A. W. Hall, Station Sup't.; H. W. McCall, Ebasco Services, Inc.; and G.E.'s R. C. Danford discuss operation of the new unit.

HIGH SPEED OPERATION of General Electric Type FK, 138-kv, 3500-mva oil circuit breakers provides system stability and full protection of electrical equipment.



REDUCED SOUND LEVEL is achieved through acoustic treatment of new G-E 1750-hp, 2300-volt boiler feed pump motors. Three such motors serve Murray Gill Plant.



K. G. & E., Ebasco, and General Electric Boosts Murray Gill Plant Capacity 91%

On-schedule, minimum cost installation achieved through integrated planning

The Murray Gill Station's capacity was increased to accommodate general load growth characterized by high summer loads. K. G. & E. planners decided to get the new unit on the line before the summer, making most advantageous use of it immediately. This necessitated careful planning and a large measure of utility-consultant-manufacturer co-ordination.

PRE-INSTALLATION PLANNING

To a large extent, co-operative pre-installation planning made possible the smooth, relatively rapid, on-schedule installation of all electrical apparatus. It was an example of highly-efficient manufacturer-engineering co-ordination. General Electric Power Plant Service engineers assisted Ebasco and K. G. & E. engineers in applying equipments and fitting their functions to the station's needs. The result was an installation made economically, and with no serious complication. Kansas Gas and Electric planning includes addition of another 100,000-kw General Electric turbine in the near future. And, as in the case of Unit. No. 3, apparatus will be General Electric for standardization and simplification.

MANY BENEFITS

This is typical of the many ways in which General Electric Power Plant Services can assist on your job. These services consist of application engineering, product development engineering, field service engineering, and power plant co-ordination which help to:

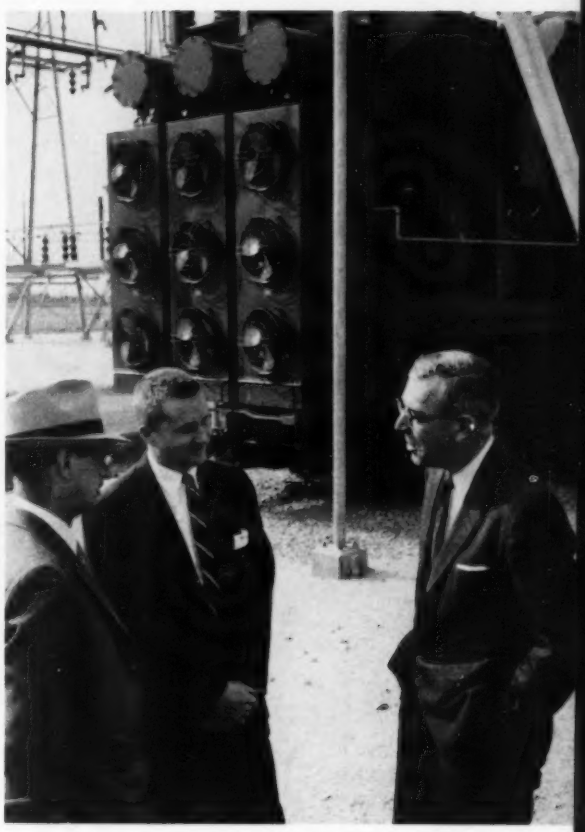
- SIMPLIFY ORDERING OF EQUIPMENT
- CONSERVE ENGINEERING TIME
- INTEGRATE EQUIPMENT DESIGN
- SPEED CONSTRUCTION
- ASSIST IN TRAINING OPERATORS

For full information on these Power Plant Services, contact your General Electric Apparatus Sales Office or write for 28-page bulletin GEA-6320 to General Electric Company, Section 302-17, Schenectady 5, N. Y.

FOR MORE DATA TURN PAGE ▸

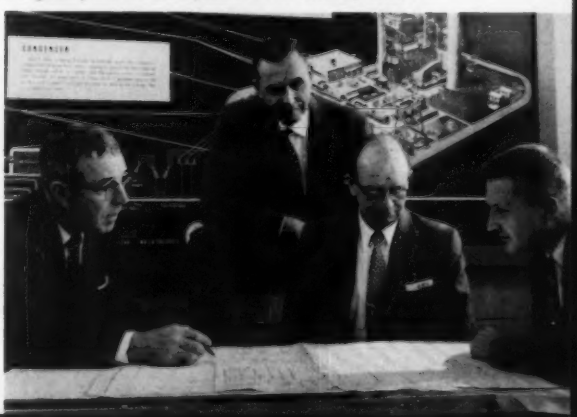
MORE POWER TO AMERICA

GENERAL ELECTRIC



TIME WAS SAVED in installation by shipping this G-E Type FOA-T, 125,000-kva power transformer upright with unit coolers in place. K. G. & E.'s E. D. St. John, (left), Sup't. of Production, and S. J. Sickel (right), Vice-president—Operations, confer with General Electric Sales Engineer C. S. Clark.

INTEGRATED ENGINEERING was key to smooth, on-schedule installation of unit No. 3. In this planning conference are (left to right) S. J. Sickel, K. G. & E.; W. O. Harris, Ass't. Construction Mgr., Ebasco; E. D. St. John, K. G. & E.; and C. S. Clark, G.E.



HOW TO

ENGINEERING TEAMWORK saved time and money. At this meeting in Ebasco's New York office, (left to right) R. R. Bennett, Ebasco Mech. Engr.; D. T. Warner, G-E Sales Engr.; F. A. Ritchings, Ebasco Chief Mech. Design Engr.; R. H. Crone, Ebasco Elect. Engr.; and G. Spillane, G-E Application Engr. discuss Station's equipment needs.

General Electric application engineers help assure on-time start-up

Speed and reduced costs result from early, integrated planning

In the case of Kansas Gas and Electric's addition of unit No. 3 to the Murray Gill Station, co-operative engineering between manufacturer, consultant, and utility was highly successful. The early conferences between General Electric application engineers and Ebasco engineers helped Ebasco design and construct the most efficient and economical station for K. G. & E.'s needs.

When manufacturer and consulting engineer sit down at a planning conference, a great variety of highly specialized skills is brought to bear on selecting the proper electrical apparatus to provide maximum effectiveness and flexibility of your power station. For the manufacturer's contribution to this team, General Electric assigns a staff of engineers representing many years' experience in providing General Electric Power Plant Services.

As requirements in power station equipment grow to higher ratings, improved efficiencies, and even greater reliability, the advantage of selecting General Electric apparatus, combined with time-saving, money-saving General Electric engineering teamwork, offers electric utilities increasing reason to call in General Electric early when planning a new station.

LIVE BETTER ELECTRICALLY

MORE POWER TO AMERICA

GENERAL ELECTRIC

Mobile Transformer Eases Replacements

DISTRIBUTION—Maintenance

R. H. SIMS, Superintendent, Coast Division, Jersey Central Power & Light Co, Asbury Park, N. J.

A specially designed 3-phase mobile transformer simplifies replacement of banks up to 300 kva without service interruptions for Jersey Central Power & Light Co.

The equipment consists of three dry-type 100-kva single-phase transformers in a single case mounted on a 1½-ton truck. High and low-voltage terminal boards are accessible through a door on the transformer case. Voltage connections on the terminal board are identical to those in common use on the system: Primary voltages of 2,400 v delta, 4,160 v wye, and 4,800 v delta; low-side voltages of 120/208 v wye or 120/240 v delta.

Primary Leads No. 4

Primary leads are No. 4, and secondary leads two 300-MCM cables per phase. All cables are rubber insulated with a neoprene jacket. An extra heavy, cured-in-lead jacket is used to withstand the abrasion involved in a portable operation.

Cable connections to distribution lines are made through a hatch in the truck roof. Openings in the hatch lid allow it to be closed with cables in place during foul weather.

All cables terminate in mechanical jumper clamps, one variety of clamp for primary and another for secondary leads. Colored tapes on both ends of each cable assist in making connections in proper phase sequence.

Fans Help Ventilate

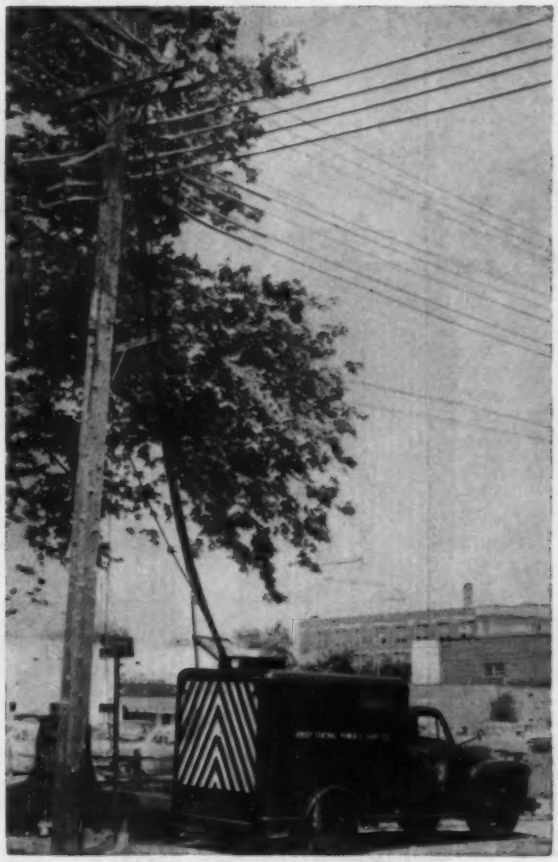
Transformers are cooled with forced air provided by two ventilating fans. Air flows from the bottom of the truck through the transformers and exhausts at the top. Fans are tapped to low-voltage windings and operate whenever transformers are energized.

Truck Was Trouble Rig

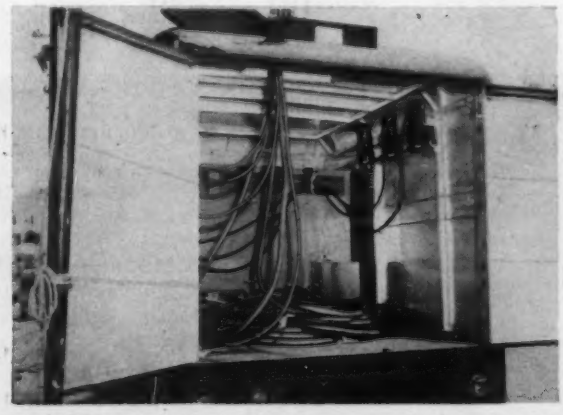
The truck is a 1½-ton former trouble rig. It was made available because the ladder and body were damaged in an accident, and its high mileage did not warrant reconditioning for trouble service.

A box-type body was built on the truck chassis. Two red lights on each side of the body flash alternately when the transformers are energized.

(*More How To on page* 98)

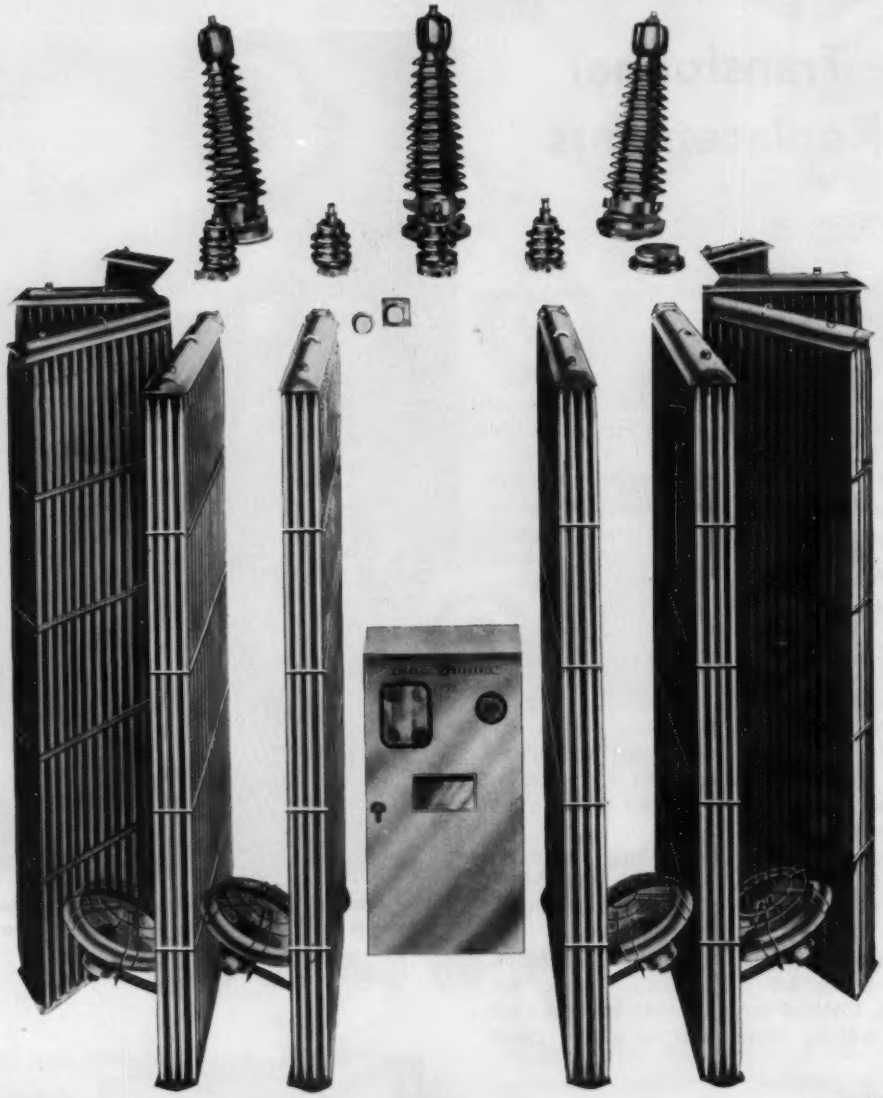


TRUCK contains the three-dry-type, 100-kva single-phase transformers used in the replacement of line transformers



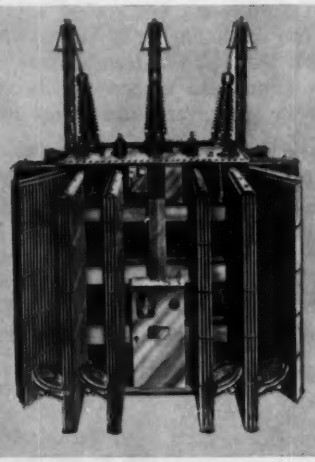
CONNECTIONS to distribution lines are made through hatch in roof. Cables terminate in mechanical jumper clamps

NEW FROM GENERAL ELECTRIC:



TYPICAL UTILITY-PREFERRED PD FEATURES:

- **COOLING:** Location of cooling equipment for self-(OA), fan-(OA/FA and OA/FA/FA), or forced-oil-cooled (FOA) units provides easy access for handling and maintenance.
- **CONTROL CABINET FOR ACCESSORIES:** Eye-level location simplifies operation and maintenance.
- **BOLTED COVER:** Reusable Nitrile rubber gaskets help keep domed cover liquid- and gas-tight.
- **BUSHINGS:** All are ASA-standard.
- **LTC:** Proven reliable load tap changer has hinged doors and is shipped in place.
- **NO-LOAD TAP CHANGERS:** Single, floor-level operating handle is used.



PREFERRED DESIGN* POWER TRANSFORMERS

Utility-preferred features in a better transformer, shipped 6-12 weeks faster

A new line of power transformers—called Preferred Design—available from General Electric, offers unprecedented advances and advantages to the utility industry.

Designed to fulfill the vast majority of your requirements for three-phase transformers in any kva rating up to and including 50,000 kva (maximum rating), this new family of PD units is available in OA, OA/FA, OA/FA/FA, and FOA types, and in 69-, 115-, and 138-kv classes with and without load tap changing. The line incorporates features carefully selected after extensive surveys and analyses of industry practices and preferences. Here are just a few of the tangible benefits to users of PD transformers:

BETTER TRANSFORMERS, with extraordinary flexibility in electrical characteristics, result from the application of a 705 Electronic Data Processing Machine to transformer design. This computer performs design operations up to 3800 times faster than hand methods, makes more precise and comprehensive calculations, and helps provide the optimum design for each application.

APPROVED CONSTRUCTION DRAWINGS will be sent *with the proposition* on all Preferred Design transformers. This speeds utility substation design and construction, helps you cut costs by eliminating delays.

SHIPMENT 6 TO 12 WEEKS SOONER is standard practice with PD transformers, because the speed of the 705 eliminates weeks of laborious engineering calculations.

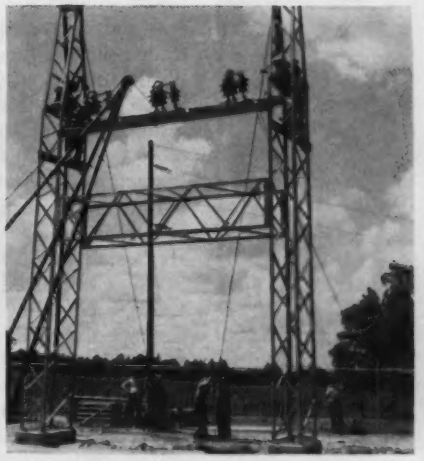
COMPLETE INFORMATION can be obtained by contacting your G-E Sales Engineer or by writing to Section 426-1, General Electric Company, Schenectady, N. Y.

*Preferred Design (PD) power transformers contain features which, based on surveys of electric utilities, have an average acceptance of 86%.

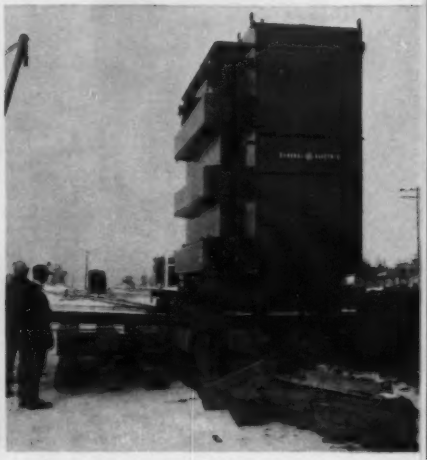
Progress Is Our Most Important Product

GENERAL ELECTRIC

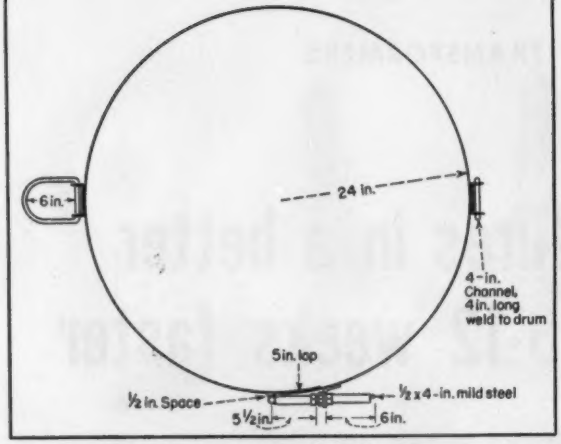
BETTER TRANSFORMERS result from optimizing of designs by new IBM-705 computer.



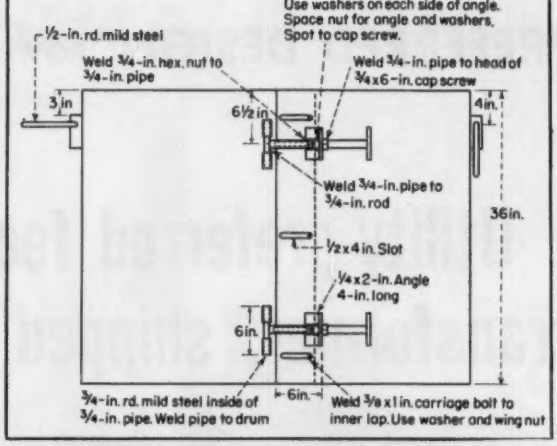
CONSTRUCTION DRAWINGS submitted with propositions will speed your construction, help cut your costs.



6 TO 12 WEEKS FASTER SHIPMENT is standard on all Preferred Design power transformers.



10-GAGE STEEL provides sufficient strength for manhole neck form which measures 36 in. high and 48 in. in dia.


Use washers on each side of angle. Space nut for angle and washers. Spot to cap screw.
½-in. rd. mild steel
Weld ¾-in. hex. nut to ¾-in. pipe
Weld ¾-in. pipe to head of ¾ x 6-in. cap screw
3 in
6½ in
4 in.
Weld ¾-in. pipe to ¾-in. rod
36 in.
½ x 4 in. Slot
¼ x 2-in. Angle 4-in. long
6 in.
¾-in. rd. mild steel inside of ¾-in. pipe. Weld pipe to drum
6 in.
Weld ⅜ x 1 in. carriage bolt to inner lap. Use washer and wing nut

LOCKING T-HANDLES screw into pipe-T's to join the ends of the form. Two forms are used for necks higher than 36 in.

Steel Neck Form Cuts Manhole Construction Costs

A. J. JELKS, Dept of Water & Power, Los Angeles, Calif.

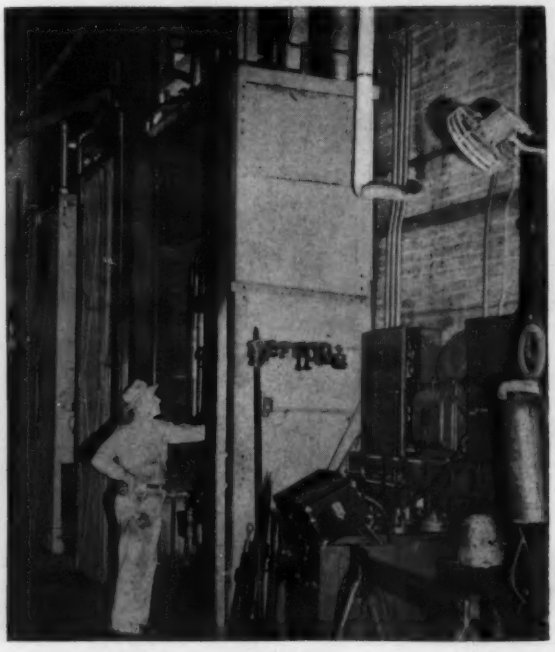
An expandable neck form saves time, labor, and materials in the pouring of concrete for manholes.

The steel cylinder, 36 in. high and 48 in. in dia, may be used for 34.5 and 138-kv, as well as lower-voltage manholes. In the pouring of a 34.5-kv manhole with a 30 to 36 in. neck, the form saves 8 to 10 hrs of labor, 160 bd ft of lumber, and 17 cu ft of concrete for a total saving of about $48.

Construction of the form is shown in the illustrations. It can be lowered into place by either a small hand or power hoist. First concrete is poured around the bottom in a layer thick enough to hold the form in place. Then it is poured to the desired height. After the concrete has set sufficiently, the form is expanded and removed.

For manhole necks higher than 36 in., two forms may be joined by a 6-in. wide contraction band. It is practicable to make a form even 72-in.

SUBSTATIONS—Maintenance



Ovens Speed Bushing Repair

A. W. SHELHORSE, Supervisor, General Repair Shop, Georgia Power Co, Atlanta, Ga.

Four electric-heated ovens have increased bushing repair efficiency at Georgia Power Co's general repair shop. Oven temperature is thermostatically controlled at 90C for as long as 30 days.

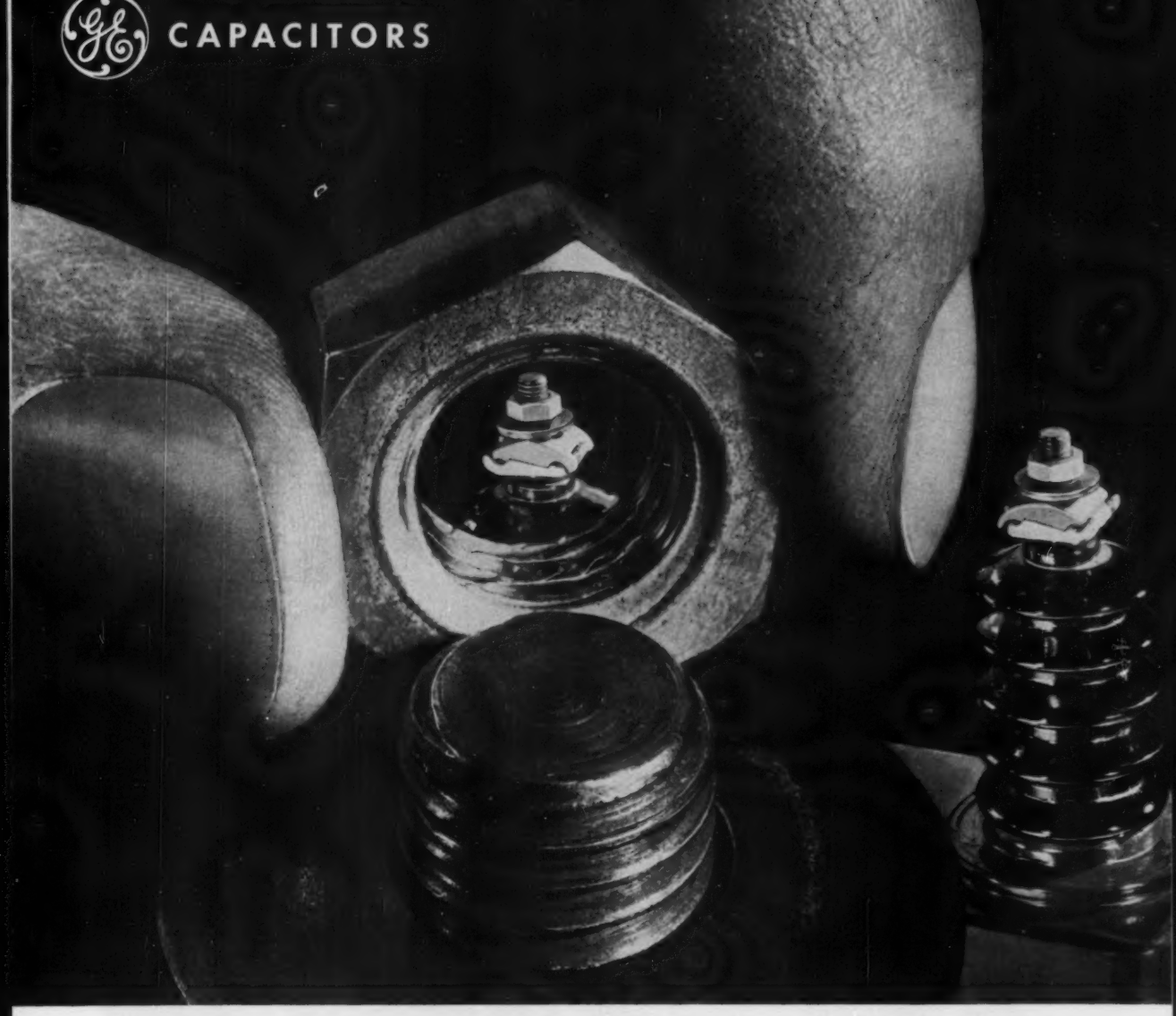
All four ovens have double walls of sheet iron. Space between the walls was filled with 1½ in. of insulation. Two ovens measure 3 x 3 x 12 ft, and the other two 6 x 3 x 12 ft, inside.

Each small oven is heated with 12 500-w, 230-v strip heaters secured near the bottom and spaced equally along the side and back walls. Large ovens are heated with 24 such strips in similar arrangements.

Air is circulated inside each oven continuously by a 1/20-hp closed-cycle fan on top. Air is pumped from the top diagonally across to the bottom. Fresh air is admitted by an adjustable opening in the suction line of the fan. Gases and fumes are exhausted out of the roof of the building through a 4-in. pipe.

(*More How To on page* 100)

RELAYING & PROTECTION



The nut that's built to strip

A capacitor with a stripped terminal stud or a broken bushing is useless for service and a tough job to repair. That's why we protect General Electric capacitors against the major cause of such damage.

The lineman who forgets his own strength or uses too big a wrench isn't likely to strip a stud or break a bushing on a General Electric capacitor. If excess torque is applied, the softer brass terminal nut is designed to strip first, before real damage is done. All our heavy-handed friend has to do is replace the nut.

Making a strong point out of weakness is another way in which General Electric designers have added to the Engineered Extras that distinguish G-E capacitors.

Want more facts? Your G-E Apparatus Sales Engineer has most of them at his fingertips. Or write to General Electric, Section 445-2, Schenectady 5, New York.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Get your feed water heaters off to a good start

Stand-in Breaker Cuts Test Operations 75%*

CLIFFORD A. DUKE, Chief, Electrical Lab & Test Branch, Tennessee Valley Authority, Chattanooga, Tenn.

A "stand-in" oil circuit breaker has been developed by Tennessee Valley Authority to substitute for installed breakers during most control-circuit tests. This substitution reduces by more than 75% the times an installed breaker must be operated, thus, cutting maintenance costs. Moreover, the stand-in breaker saves time during the actual testing.

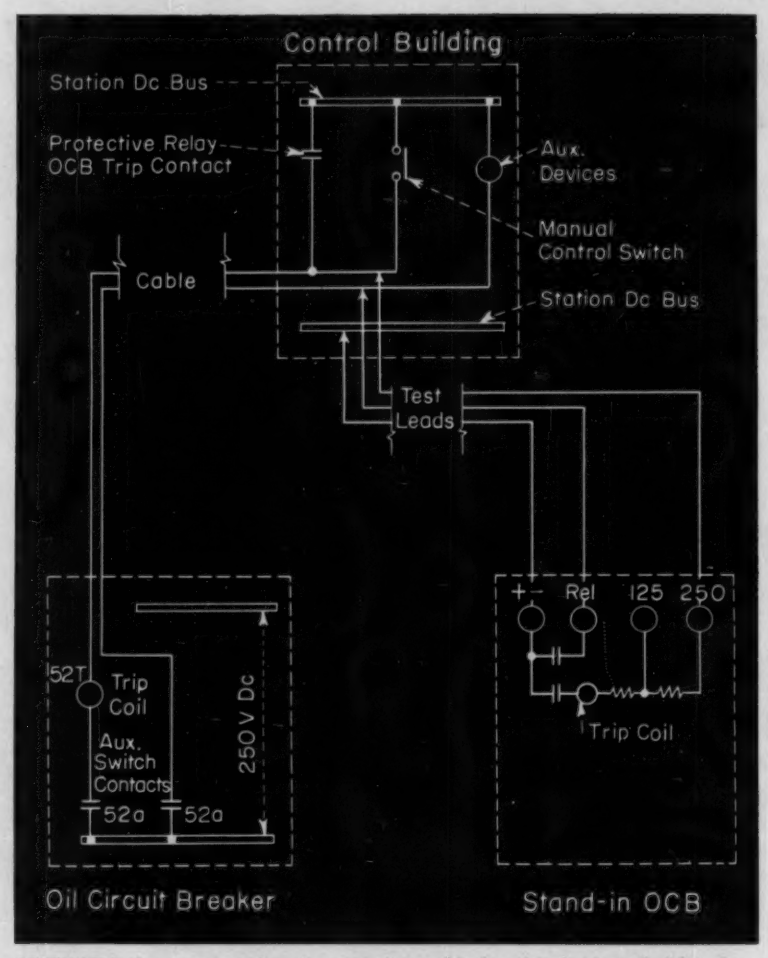
It is a simple, inexpensive device mounted in a 3 x 5 x 7-in. metal box. The major component is a two-pole magnetic trip, manually reset, trip-free air circuit breaker having 15-amp contacts. The trip coil, wound of No. 17 wire, is connected in series with resistors that limit trip-coil current to 5 amp.

Trip-Coil Current Low

This trip-coil current was selected as a compromise for testing all circuit breakers on the system having many different trip-coil currents, none of which is as low as 5 amp.

Correct operation of the relays, targets, etc, at 5 amp should assure correct operation at the higher in-service values.

Terminals are provided for 125 and 250-v dc. Contact-opening time is 1.5 cycles.



SCHEMATIC shows connections for use of stand-in breaker for installed breakers during tests on control circuits. Its use cuts OCB operations and maintenance

Supplies Battery Voltage

Connections for use of the stand-in breaker with a typical OCB tripping scheme are shown in the accompanying schematic. The OCB is left open, so that its "a" switches are open, and contacts in the stand-in breaker are closed to simulate a closed OCB. Trip contacts of the OCB energize the trip coil in the stand-in breaker, causing it to open as the oil circuit breaker would open normally.

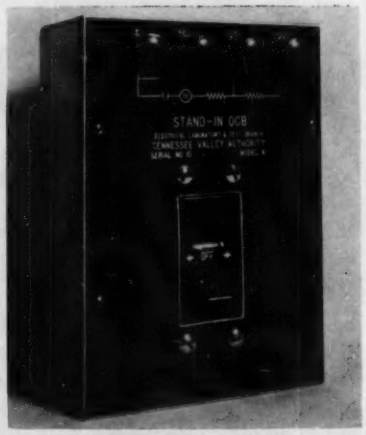
The terminal marked "REL" supplies battery voltage to the protective relay auxiliary devices, a function normally performed by an OCB "a" switch.

In simpler relay schemes, this connection may not be needed.

OCB Operations Cut

When making tests, the OCB usually is first tripped in the normal manner to check its operation and reclosing features. Then, the stand-in breaker is used for the remainder of the tripping tests.

Thus, the number of OCB operations is reduced from 20 or more to three or four. This also reduces the maintenance costs which are a function of the number of operations.



STAND-IN BREAKER is substituted for the installed OCB's during testing

* Adapted from a paper presented at the recent Doble Client Conference.

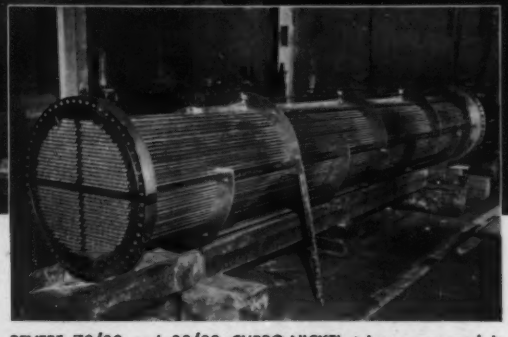
Get your feed water heaters off to a good start

. . . tube with REVERE

Since no single alloy will be most reliable and economical under all various conditions encountered, the wealth of knowledge accumulated through Revere's Research Department is of vital importance to you.

For, over the years these specialists have compiled extensive data regarding the relative corrosion resistance of the different alloys under a wide variety of operating conditions. Why not take advantage of this storehouse of facts and consult with Revere's Technical Advisory Service before selecting the tubes for your equipment?

Revere also furnishes plates, from the smallest to the largest sizes, in Cupro-Nickel, Copper, Herculoy, Muntz Metal, Naval Brass and Admiralty, and tubes in Cupro-Nickel, Aluminum Brass, Admiralty, Herculoy, Arsenical Copper, Muntz Metal and other alloys.



REVERE 70/30 and 80/20 CUPRO-NICKEL tubes were used in high and low pressure feed water heaters designed and fabricated by CONDENSER SERVICE & ENGINEERING CORP., Hoboken, N. J., for Kent Avenue Station of the New York City Transit Authority.

REVERE COPPER AND BRASS INCORPORATED

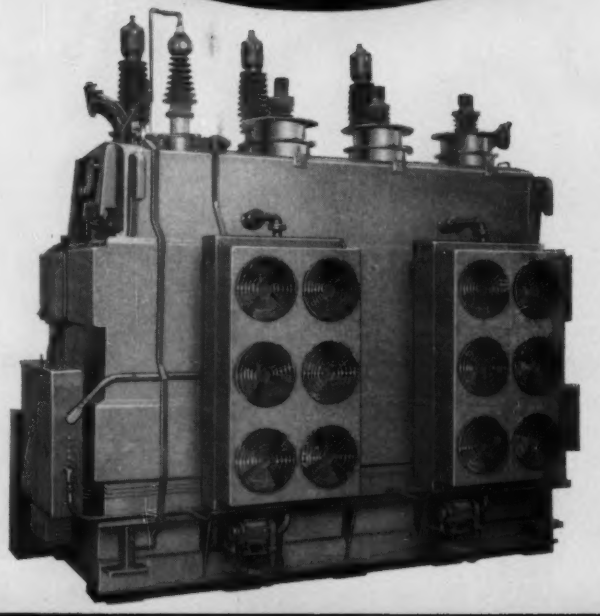
COPPER * BRASS 18 01 REVERE ALUMINUM

Founded by Paul Revere in 1801
230 Park Avenue, New York 17, N. Y.

Mills: Rome, N. Y.; Baltimore, Md.; Chicago, Clinton and Joliet, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Brooklyn, N. Y.; Newport, Ark.; Ft. Calhoun, Neb. Sales Offices in Principal Cities, Distributors Everywhere.

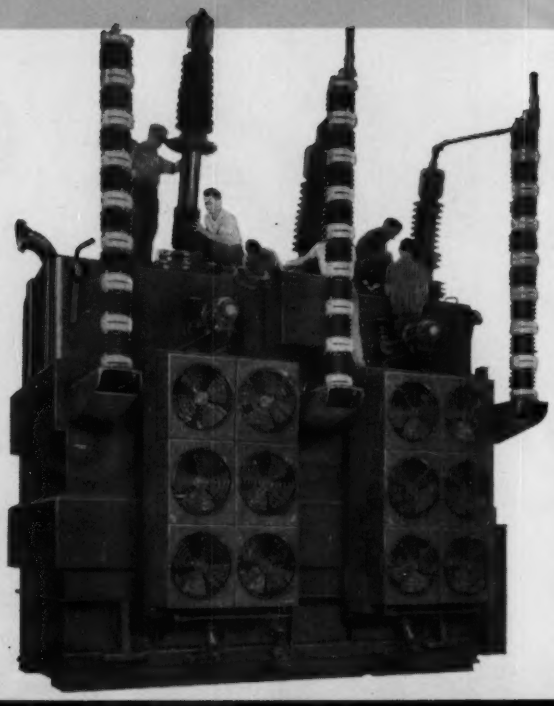
Pioneer in 1-piece upright shipment of large Power Transformers

Main Step-up GENERATING



175,000 Kva

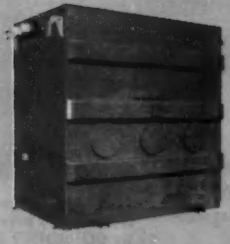
High Voltage: 115,500 Grd. Y volts
Low Voltage: 17,500 Delta volts
Oil-immersed, forced-oil-cooled with forced-air cooler



140,000 Kva

High Voltage: 115,000 Grd. Y volts
Low Voltage: 14,700 Delta Volts
Oil-immersed, forced-oil-cooled with forced-air-cooler

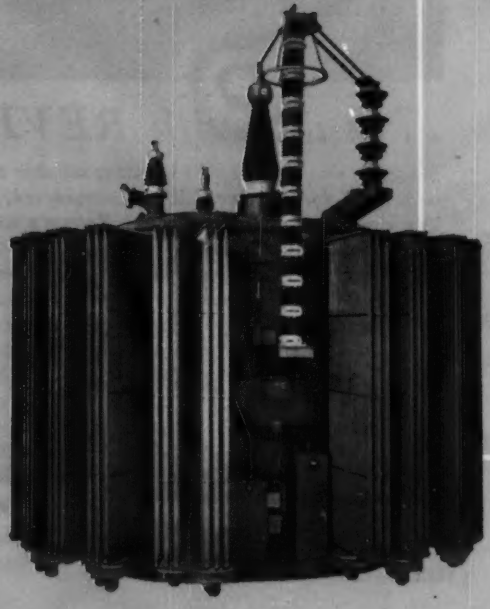
STATION AUXILIARY Transformers



2000 Kva Silicone-Insulated Dry-Type Transformer

Just as Pennsylvania led the way in one-piece shipment of large power transformers, the company also pioneered the development of silicone-insulated units — the fire- and explosion-resistant transformers that are safest of all for both indoor and outdoor installations.

The 2000 kva station auxiliary transformer pictured is a sealed-in nitrogen, dry-type unit; three phase, 60 cycles, 150°C. temperature rise; 2400Δ–480Δ volts.



SELLING

STATION TRANSFORMERS by PENNSYLVANIA

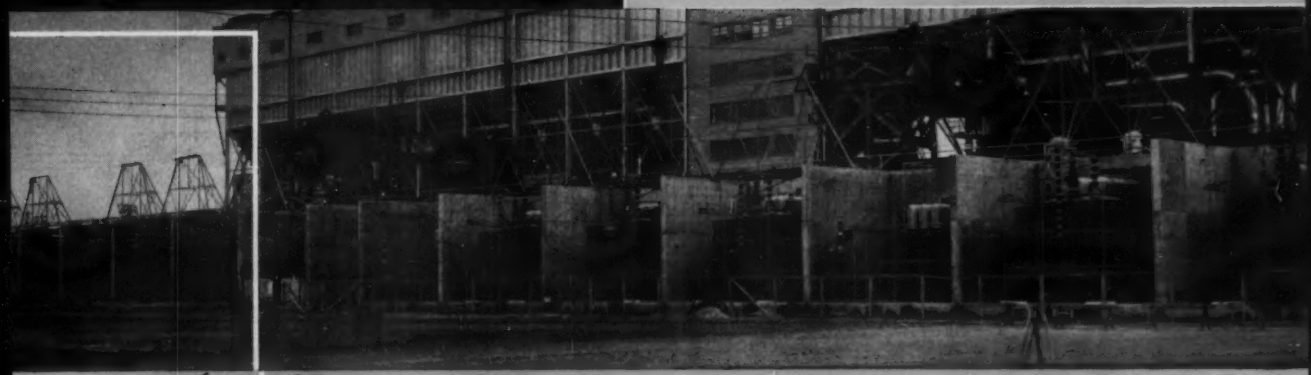
120,000 Kva

High Voltage: 145,000 Grd. Y volts
Low Voltage: 19,800 Delta Volts
Oil-immersed, forced-oil-cooled with forced-air cooler

From the standpoint of kva capacity, the three main step-up transformers pictured at the left can be classified as "large." They range in ratings from 120,000 kva to 175,000 kva. In physical size, however, their dimensions and weights were kept well within the limits for one-piece, upright shipment. This was possible because of the compact characteristics of Pennsylvania's own" contour design," shell form construction.

The units traveled to their respective installation sites in an upright position, with only bushings, cooling equipment and certain accessories removed. This meant easier handling in the field, with greatly reduced installation time and costs.

As the pioneer of one-piece upright shipment of large power transformers, Pennsylvania has long been offering this time-saving, cost-cutting advantage with core form transformers also.



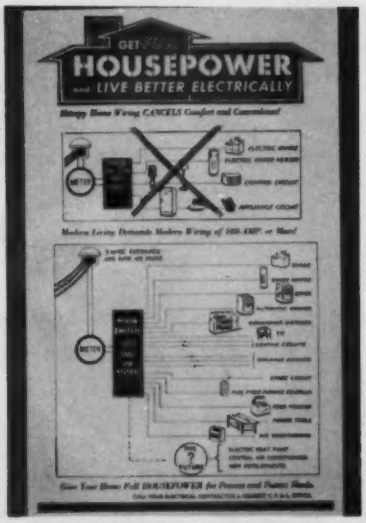
These 19 56,000/70,000 kva main step-up generating station transformers, of core form design, were shipped to their destination in an upright position, completely assembled except for bushings and detachable radiators. Of single-phase construction, these transformers have a high voltage rating of 93,000/161,000 Grd. Y volts with a low voltage rating of 19,000 volts.

PENNSYLVANIA TRANSFORMER DIVISION
McGraw-Edison Company
CANONSBURG, PENNSYLVANIA Greater Pittsburgh District

Southeast Firing LBE Salvos

Privately-owned utilities level sales guns loaded with 'Live Better Electrically' and 'Housepower' shot at booming home market

'TALKING' REDDY KILOWATT gave FL&L's LBE message at recent trade show



PROMOTION PIECE OF CP&L ties in LBE and Housepower themes at a glance

Privately-owned utilities in the Southeast are going great guns on the "Living Better Electrically" and HOUSEPOWER programs.

The basic reason is the continuing trend of business to move into the South, bringing employment, consumer spending, home construction and modernization.

Typical of the Southeast utilities' attitude is that of Carolina Power & Light Co. General sales Manager H. G. Isley calls his company's program "the answer to the 1957 challenge." CP&L is pumping money and manpower into advertising and sales promotion built around Live Better Electrically in order to "properly condition the big market for our sales allies."

CP&L plans to boost average residential use by 365 kwhr in 1957. Planning includes the sales of $37 million worth of appliances and air conditioning units by:

- Using all media to promote the LBE concept — newspapers,TV, radio stations, billboards, direct mail, handouts, window displays, shows and demonstrations, and youth and farm activities.
- Training courses for dealers and contractors.
- Employee incentive programs.
- Cooperation and assistance to architects and engineers.

Georgia Power Co is also emphasizing the role of the architect and contractor in the Live Better Electrically picture. Its all-electric kitchen was featured recently at the opening of the Architects and Engineers Institute in Atlanta.

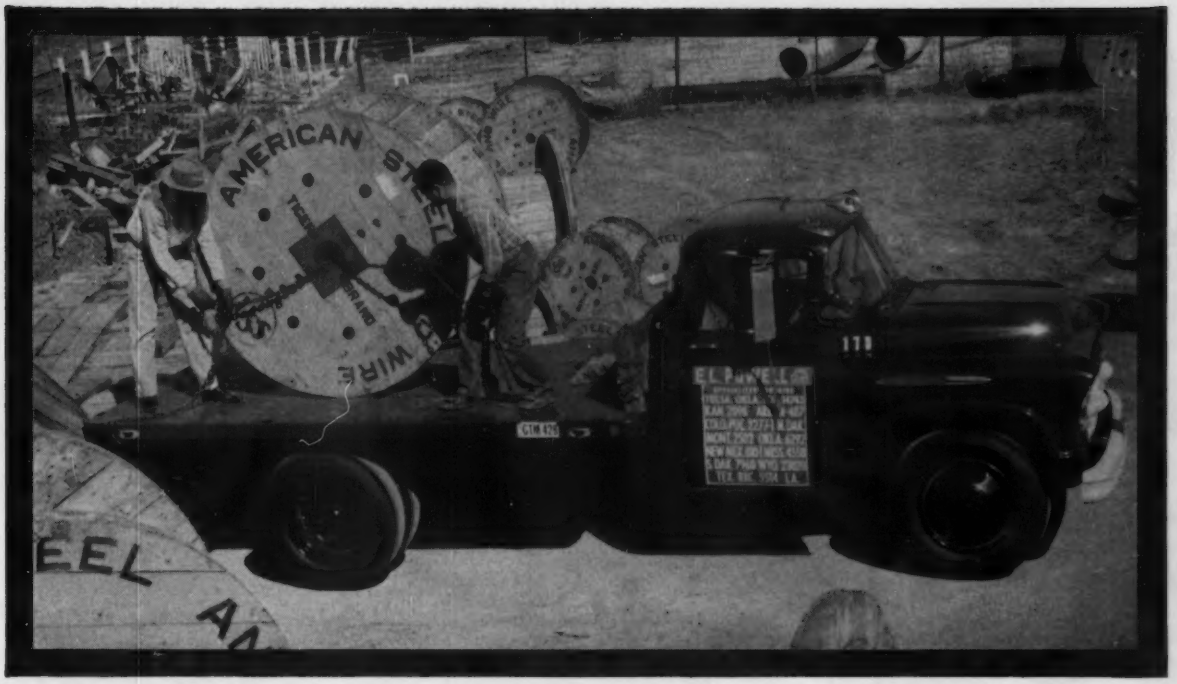
Florida Power & Light Co has built its promotion around a "Sell Better, Live Better . . . Electrically" theme. Directed to some 4,000 business allies in its area, the program is using all media. In addition, the company regularly promotes the LBE theme in its monthly publication, "Sales Developer," and is passing out much standard LBE material. FP&L to date has distributed 30,000 LBE "idea" booklets, 126,000 mailers, and 10,000 copies of a wiring manual specifically edited for contractors in Florida. The company also has an aggressive home service program. (They made 225,485 calls last year.) At the Miami home show held recently, FP&L sponsored what is believed to be the only Southeast appearance of the GE Live Better Electrically caravan.

(*More Selling on page* 106)

ADVERTISING and Sales Promotion for 1957
Helping Sell Better...Electrically
SELL BETTER...ELECTRICALLY
1957 SALES PROGRAM
'SELL BETTER...LIVE BETTER...ELECTRICALLY' PROGRAM TO TOP $107 MILLION IN '57
'57 REMAINS STEADY!
YOU DID IT AGAIN!

FP&L NEWSPAPER, Sales Developer, outlined company's 1957 promotion plans to more than 5,000 sales, trade allies

ALL-ELECTRIC KITCHEN was put through paces at show by Georgia Power's pretty home economist, Regina Claunch

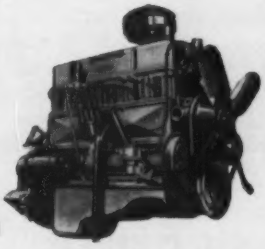


POWERFUL REASONS WHY A CHEVROLET STAYS ON THE JOB...SAVES ON THE JOB!

FAMOUS CHEVY 6

(America's most popular truck engine)

- Fuel-saving 8 to 1 compression ratio
- Low-maintenance valve-in-head design
- Two fuel filters for dependability
- Durable alloy steel exhaust valves
- High power-output ignition
- Economical by-pass cooling



Chevrolet trucks offer the world's most popular truck engines—big 6's, designed soundly yet simply to provide plenty of power at lowest cost and the ability to keep going in rugged service. Like all Chevrolet truck components, these engines put the accent on economy and dependability!

Chevy's the dollar saver *de luxe* of the American road, and many of the reasons why can be found beneath the Chevrolet truck hood. That's where you'll often find one of the great 6-cylinder powerplants that have pulled more payload more miles than any other engines in the history of hauling. They're honest-to-goodness *truck* engines, specially built to *stay* and *save* on the roughest and toughest of hauling jobs. Or, if you prefer a V8, the ones that hum beneath the Chevy hood are at the head of their class for fleet-going short-stroke V8 efficiency.

You'll find that a Chevrolet truck gives you *so much* to save with! Your Chevrolet dealer is waiting to fill you in on all the facts. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

Biggest sellers . . . because they're biggest savers! CHEVROLET

CHEVROLET TASK·FORCE 57 TRUCKS

QUICKER-SAFER-CHEAPER SPLICES WITH THE

NEW 4U HARDY UNIVERSAL PRESPLICE CUTTER

"Presplices" aluminum, soft copper and ASCR for easy sleeving

$14.95

Tailors the conductor end without adjustments or change-pieces. Available with hickory handle or 20,000 volt test poly-vinyl chloride handle for extra safety on glove-voltage operations.

Cuts clean edges. No bird-caging! CU and Alum to 2/0

ASCR to 1/0.

Cuts core separately

Drop a card – Ask for Bul. 221

INTERSTATE DROP FORGE CO.

SPECIAL PRODUCTS DIVISION

4005 N. 27th ST., MILWAUKEE 16, WISCONSIN

Continental Radiant Glassheat photo

ELECTRIC RADIANT GLASS PANELS line walls of drafting room at Petch Mfg. Co. Building, in northern Michigan. Building has 61 such panels totalling 83 kw

Electric Heat Warms Up Plant Operation

Some previous experience with electric heat, and a desire to make his operations as modern and efficient as possible led one Michigan manufacturer to install radiant electric heat in his new plant.

C. L. Petch, president of Petch Mfg Co, located in Alpena in northern Michigan on Lake Huron, has some 61 electric radiant glass panels heating 60,000 cu ft of office and drafting room space in his new factory. This in an area where the degree-days for the first 71 days of operation totalled 2,499!

Area heated is divided into 28 offices and corridors. Building walls are well insulated and ceiling has the equivalent of 6 in. of rock wool. Heating circuits are separately metered, and total connected load is 83 kw. Kwhr consumption for the first 145 days of operation was 48,600, for a daily average of 404.1. Maximum demand this last heating season was 34.8 kw.

Unique feature of the installation is the routing of all circuits through a device which limits demand to 50% of installed load. Called a "Demantrol", it is said to reduce kwhr consumption, and provide better utilization of both power and installed load.

Plant is on lines of Alpena Power Co, a privately-owned utility.

H & C BRIEFS

Lewyt Adds Built-in A.C.'s

Lewyt Air Conditioner Corp has added a production line for built-in wall air conditioners for apartment houses. The units slide in "shells" put into the walls during construction. The new units were specifically designed for the New York City market. They are said to be moving off the production line at the rate of 500 a day.

Carrier Appoints Distributors

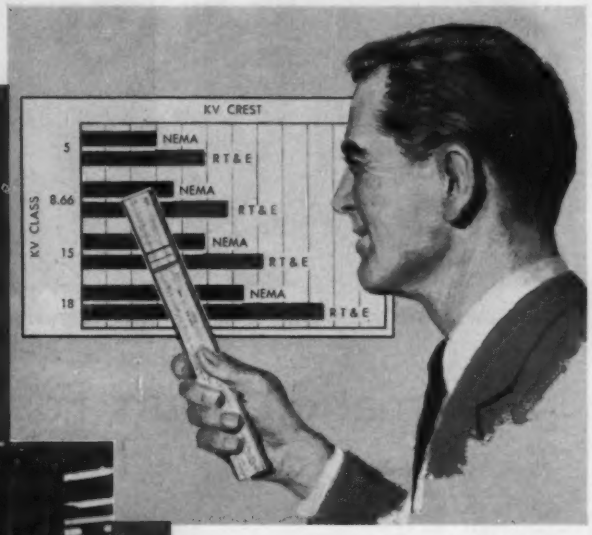
Carrier Corp has appointed two distributors for its line of unit heaters: Norman S. Wright & Co of Phoenix, Ariz., and McMillan Equipment Co of Houston, Texas. Both firms will handle the complete lines plus heating and ventilating equipment.

(*More Selling on page* 108)

IMPULSE TESTED

DESIGN

High impulse strength in transformers is not attained by accident; it must be considered from the very beginning of design. Such is the case at R T & E, where transformer design is based on impulse withstand levels approximately 50% in excess of NEMA standards.



TESTING

Every R T & E Transformer receives an "on the line impulse test" through use of the most modern equipment and methods known. This test not only insures that the transformer meets NEMA impulse level requirements but also rejects those transformers that are not of maximum quality.

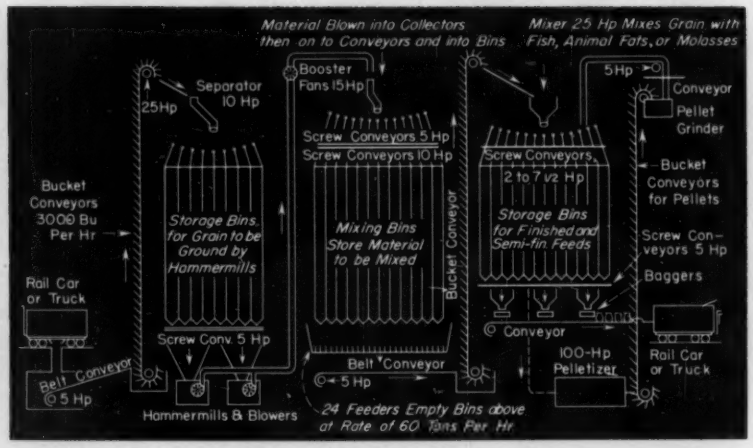
OPERATION

Naturally, the ultimate in testing is provided "on the system", where nature subjects the transformer to the most rigorous tests. R T & E Transformers have been thoroughly proven in operation in every climate of the U. S. They have been awarded the invisible seal of customer satisfaction, proved by a growing list of customers who specify R T & E.

R T & E CORPORATION
WAUKESHA, WISCONSIN

Helping provide power for America

Feeder control panel . . .


Material Blown into Collectors then on to Conveyors and into Bins
Mixer 25 Hp Mixes Grain with Fish, Animal Fats, or Molasses
Booster Fans 15 Hp
Separator 10 Hp
25 Hp
5 Hp
Conveyor
Pellet Grinder
Screw Conveyors 5 Hp
Screw Conveyors 10 Hp
Screw Conveyors 2 to 7 1/2 Hp
Bucket Conveyors for Pellets
Bucket Conveyors 3000 Bu Per Hr
Storage Bins for Grain to be Ground by Hammermills
Mixing Bins Store Material to be Mixed
Bucket Conveyor
Storage Bins for Finished and Semi-fin Feeds
Screw Conveyors 5 Hp
Rail Car or Truck
Baggers
Conveyor
Screw Conv. 5 Hp
Belt Conveyor 5 Hp
Belt Conveyor 5 Hp
100-Hp Pelletizer
Rail Car or Truck
Hammermills & Blowers
24 Feeders Empty Bins above at Rate of 60 Tons Per Hr

mixes more than 400 tons of feed a day as . . .

Automation Spurs Feed Mill Production

L. A. FLYNN, Industrial Power Engineer, West Penn Power Co, Connellsville, Pa

A fully automated and integrated feed mill, requiring a minimum of attention and maintenance, that can grind, mix, blend, and bag a whole carload of ingredients and ship it out as complete feed the same day in the same car it arrived in—that's the new Allied Mills plant in Everson, Pa.

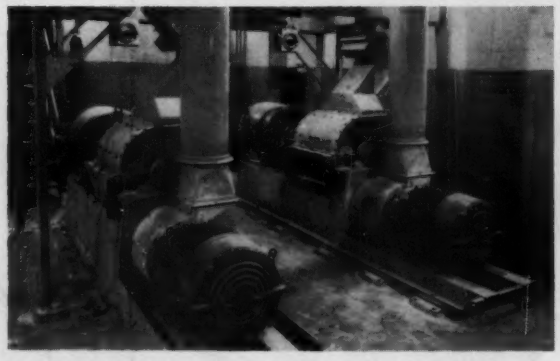
Using the latest developments in automation and materials handling, Allied processes over 400 tons of feed daily with only 50 men. And the speed of processing means savings in transportation costs. Shipping finished feed in the same car it arrived in, Allied takes advantage of "in transit" rates on shipments from raw materials sources to eastern distribution points.

Heart of the all-electric mill is a feeder control panel which regulates the amount of each ingredient used according to the formula set up on its dials. Compact load center distribution units bring the high voltage close to the load, assure easy starting and long motor life. Air-cooled, explosion-proof motors and explosion-proof lighting are used in all potentially dangerous areas. A dust collection system keeps the inevitable dust to a minimum. Total connected load is 1,541 h.p.

Incoming ingredients are carried to the top floor by a 25-hp bucket conveyor with a capacity of 3,000 bushels per hr. A 10-hp separator distributes them into the grinding bins. They are then fed by a 5-hp screw conveyor to the 100-hp hammermills. Forty-hp blowers and 15-hp booster fans blow the ground ingredients up to the collector bins; five and 10-hp conveyors carry them into the mixer storage bins.

Twenty-four feeders, operated by the feeder control panel, release predetermined amounts of each ingredient. A 5-hp horizontal conveyor and a bucket conveyor carry the selected ingredients to a 25-hp mixer. For some uses, mixed feeds are pelletized by a 100-hp pelletizer before bagging; others are bagged at once. Conveyor carries the bags to the outgoing freight car.

According to Plant Manager D. A. Mote, the safe, sanitary, and speedy handling of such large amounts of feed would be impossible without automation and electric materials handling.



40-hp blowers move ground feed . . .

Load center units ease motor operation

Reduce Sag -- Burndown !

Reduce Annealing

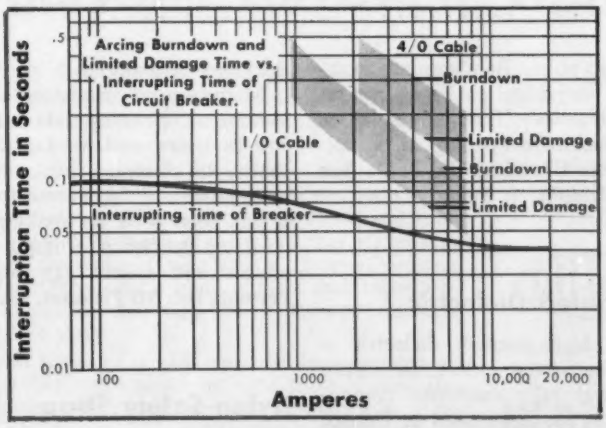
All Allis-Chalmers Air Magnetic Breakers are 5 cycle

NOW — 5 cycle interruption is standard on all Allis-Chalmers air magnetic breakers at no increase in price. Typical interruption curve for a *Ruptair* magnetic breaker is superimposed on a wire burndown characteristics chart shown below to illustrate the coordination that may be obtained with these Allis-Chalmers breakers.

The faster clearing time afforded by these breakers will reduce the effect of a fault on the system — reduce the problem of sagging wires, annealing and burndown.

All Allis-Chalmers switchgear assemblies and primary unit substations are equipped with these 5 cycle *Ruptair* breakers.

For further details contact your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.



A commonly used overhead distribution wire is No. 4 wire. This curve shows no wire damage occurring when coordinated with this 5 cycle breaker. Notice that interrupting time is well under 5 cycles on heavier currents and is fast on low currents, too.

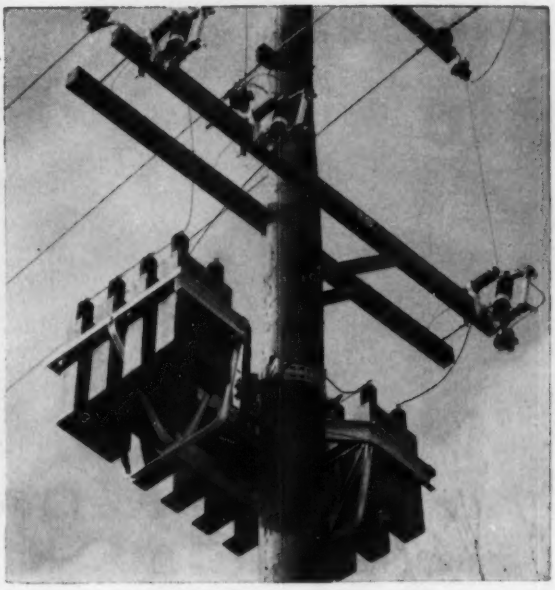
ALLIS-CHALMERS

A-5257

for progress in switchgear

NEW EQUIPMENT

Capacitor Mount



This capacitor cluster mount takes standard NEMA capacitors as large as 50 kvar and clamps directly to poles between 7 and 14 in. in diameter, without holes in the pole. Capacitors, wiring and accessories may be assembled on the ground and then hoisted into position as a unit. Attachment of pole band, tightening two carriage bolts, and adjusting levelling bracket complete the installation.

Structural bracing legs reportedly provide stable support during assembly and wiring, keep capacitors and oil switches off the ground. Brackets also facilitate mounting oil switches. Design is said to leave clear climbing space on band side of assembly.

Joslyn Mfg & Supply Co, 3700 S. Morgan St, Chicago 9, Ill.

Turret Derrick

This hydraulic derrick features 360-deg rotation and elevation to within 15 deg. of vertical. It will raise a load 40 ft and has aerial lift attachment which provides platform for overhead work. Maximum lifting capacity is said to be 10 tons in vertical position, 1.5 tons when fully extended in horizontal position.

Unit has 127-in. collapsed length, mounting needs 14-in. space between cab and body. Derrick movement can be controlled by crew in basket. Central hydraulic system powers derrick and built-in winch, also can operate diggers and tamp.

Truck Equipment Co, Denver, Colo.

Pole Preservative

A bandage-type treatment using sodium fluoride and 10% pentachlorophenol is available for preventing ground-line rot and insect damage to standing poles. Known as K-Ban, it is said to be fast, easy, clean, and economical. It consists of a preservative grease, known as Pol-Nu, enclosed in an envelope of impervious, thermo-plastic coated paper.

To apply, bandage is opened to full 24-in. width, wrapped around pole with two in. protruding above ground-line, and stapled in place. Manufacturer claims only tools needed are shovel, wire brush, and staple gun. The water-soluble sodium fluoride is said to speed action on damp poles. Bandages are available in individual packages in sizes to fit all poles. Tear strip on three edges facilitates opening.

Chapman Chemical Co, P. O. Box 138, Memphis 1, Tenn.

Laminated Dielectric

This high strength dielectric is available in the U.S.A. in sheets, rods, and fully machined components. It has been used in Europe for many years. A fully impregnated, densified wood laminate, it is said to be comparable to fabric base laminates electrically and to have good mechanical characteristics. Maximum length is 13 ft, maximum thickness of material, 5 in.

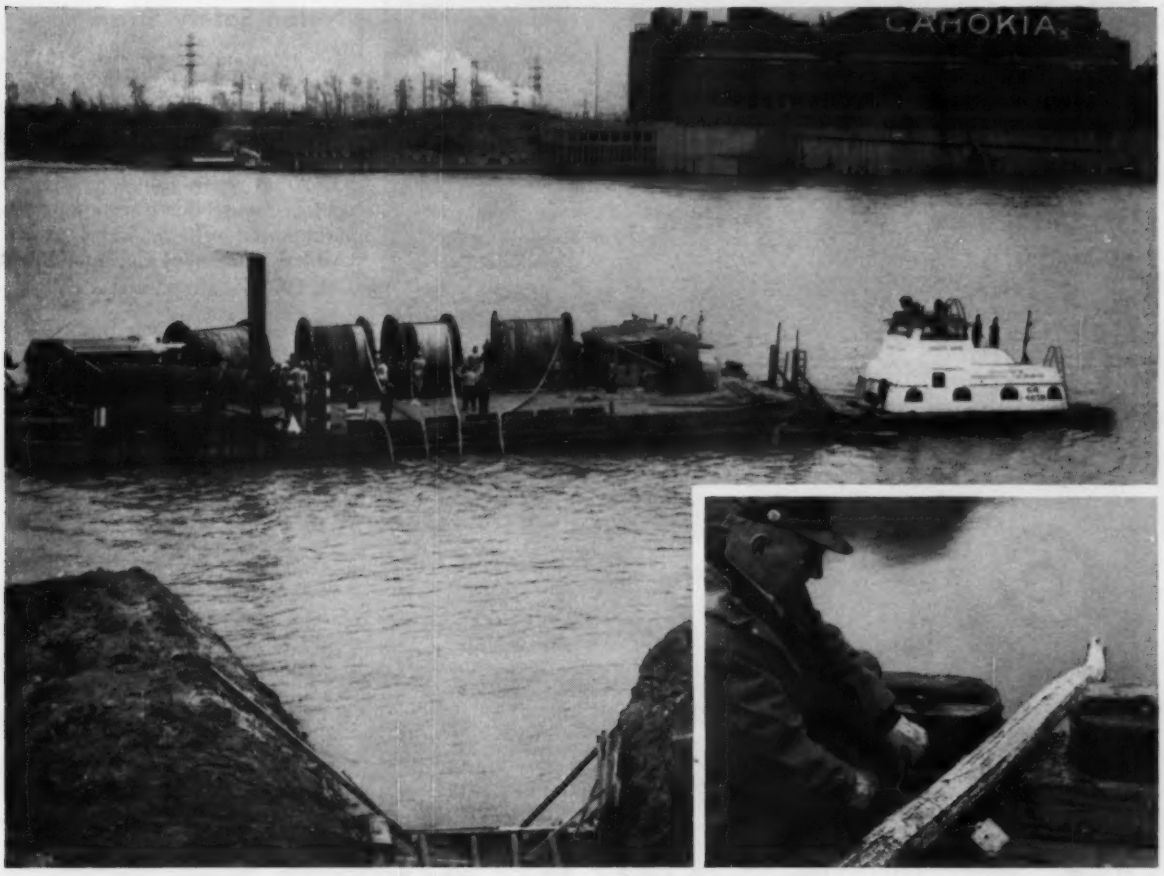
Manufacturer recommends it for switchgear operating rods in oil circuit breakers, and for tap changer shafts, coil clamping rings, and insulating studs and nuts in transformers. It has been used for making large insulated structures for impulse generators and sphere gap supports.

Permali, Inc, Mt Pleasant, Pa.

Nylon Safety Strap

Made of double impregnated, solid woven, spun webbing, nylon safety straps are said to have high dielectric qualities. Red center indicates when replacement is necessary.

(*Continued on page* 112)



UNDER THE MIGHTY MISSISSIPPI

Neoprene guards Union Electric cables from galvanic corrosion, vibration and strain

In January, Union Electric Company laid four submarine cables under the Mississippi River from its Cahokia, Ill., plant to St. Louis, Mo. These lead-sheathed cables, protected with neoprene covers, lie 11 to 14 feet below the river bed.

Neoprene protective covering serves as a cushion between the steel wire armor and the lead sheath, and helps reduce galvanic corrosion of the wire armor. It reduces scoring of the lead and the effects of vibration, bending and strain. Neoprene is more resilient than other protective materials and provides an extra layer of protection for the lead sheath.

Union Electric Co. also has eight neoprene-covered lead-sheathed cables under the river at its Venice, Ill., plant farther upstream. They were put down in 1950.

These installations are another example of the accepted reliability and long life of neoprene. Of all resilient materials, only rugged neoprene has balanced resistance to sunlight and weathering, oils and chemicals, heat, flex, cracking, abrasion and cutting, oxidation and aging.

Ask your supplier about wire and cable jacketed with neoprene. It's available in single and multiple conductor types and voltage ratings to meet your requirements. Mail the coupon below to get the ELASTOMERS NOTEBOOK with actual on-the-job reports of neoprene's performance in a wide range of industrial products.

DU PONT
REG. U. S. PAT. OFF.

Better things for better living
. . . through chemistry

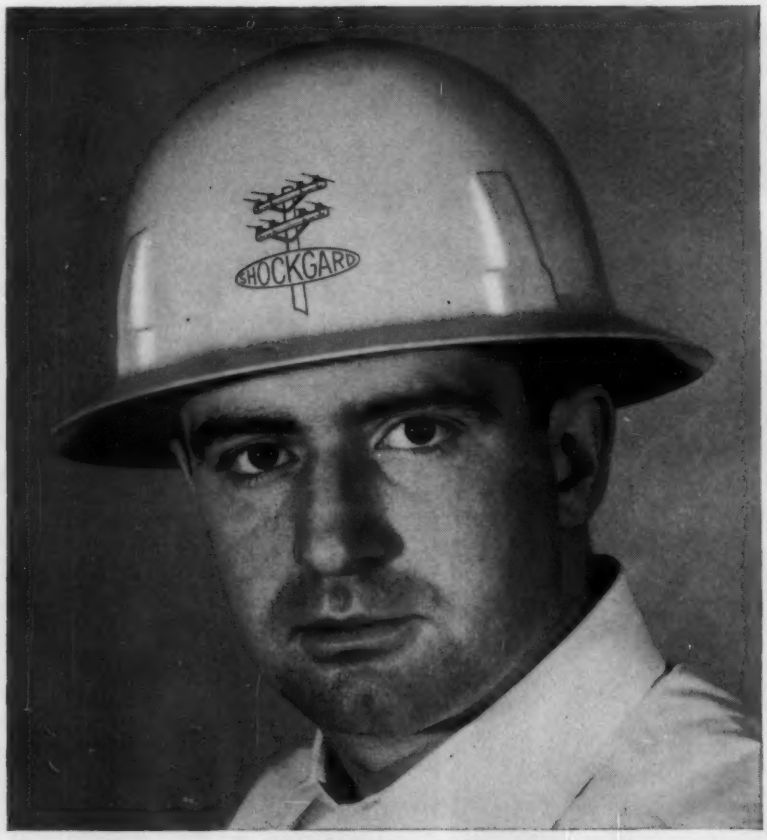
NEOPRENE
— made by Du Pont for 25 years

E. I. du Pont de Nemours & Co. (Inc.)
Elastomer Chemicals Dept. EW-6
Wilmington 98, Delaware

Please put my name on the mailing list for the Elastomers Notebook.

Name_____
Position_____
Firm_____
Address_____
City, State_____

MAIL THIS COUPON NOW . . . WHILE YOU'RE THINKING ABOUT IT



M-S-A® Shockgard

NEW—IMPROVED

Offers these important protective features:

- Meets all E. E. I. Specifications
- Dielectrically tested at 15,000 volts
- Withstands 40 foot lb. impact
- Weighs less than 15 ounces

There's no question that this M-S-A Shockgard passes every protective test in the books—but that's only half the story. Equally important is the M-S-A *hat-by-hat* testing program that makes sure every Shockgard sold *maintains* the high safety factor specifications. This testing program is not a matter of "batch" approval, or control sampling. *Each and every* Shockgard is examined and tested. And we can uphold this rigid standard because our complete manufacturing facilities are under one roof —from material preparation to packaging and shipping.

The new Shockgard is available in yellow or grey. There is no metal in any part of the hat. The snap-in suspension is easily adjusted, quickly replaced, and eliminates pressure points. *Write for details.*

Leather or leatherette sweatband; winter liners and chin straps available

MSA
SAFETY EQUIPMENT HEADQUARTERS

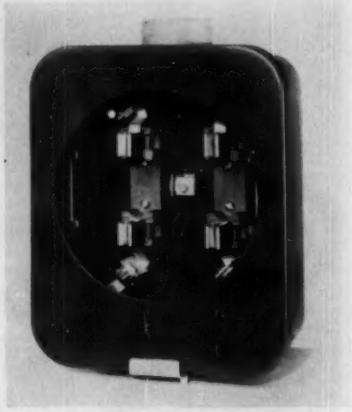
MINE SAFETY APPLIANCES CO.
201 North Braddock Avenue, Pittsburgh 8, Pa.
At Your Service: 76 Branch Offices in the United States
MINE SAFETY APPLIANCES CO. OF CANADA, LTD.
Toronto, Montreal, Calgary, Edmonton, Winnipeg, Vancouver, Sydney, N. S. • Representatives in Principal Cities in Mexico, Central and South America
Cable Address: "MINSAF" Pittsburgh

Nylon Safety Strap

(*Continued from page* 110)

With single tongue buckle, buckle hole reportedly yields at 1,550 lb on a straight pull and at 3,450 lb when tested as used on pole. Cross section breaking strength is reported to be 5,500 lb.

Miller Equipment Co, Inc, Franklin, Pa.



Ringless Meter Socket

This 100-amp ringless meter socket, known as the 500, has a flanged, deep-drawn, one-piece body; a neoprene gasket to eliminate the customary metal sealing ring; and a massive hub, swaged into position as an integral part of the box. Large wiring space reportedly simplifies installation.

Available in 4- and 5-terminal models, it has lay-in type connectors which take No. 2, 6, and 10 wires simultaneously or up to No. 1/0 wire. Ground lug takes two No. 1/0 wires. Surge gap grounding facilities are standard; disconnect and bypass facilities optional.

Superior Switchboard & Devices Co, Canton, Ohio

Helical Spring Washers

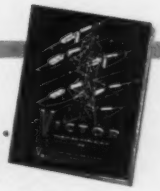
When used on power pole assemblies, double coil, helical spring washers reportedly reduce looseness caused by wood shrinkage, bolt elongation, or wind vibration. Resiliency is said to eliminate frozen

(*Continued on page* 116)

"I'll never replace VICTOR SUSPENSIONS... I just won't live that long!"

Men who purchase insulators are enthusiastic about the service records of VICTOR Suspensions. That's because VICTOR Suspensions are laboratory designed, manufactured under rigid quality controls and tested with the industry's most modern equipment.

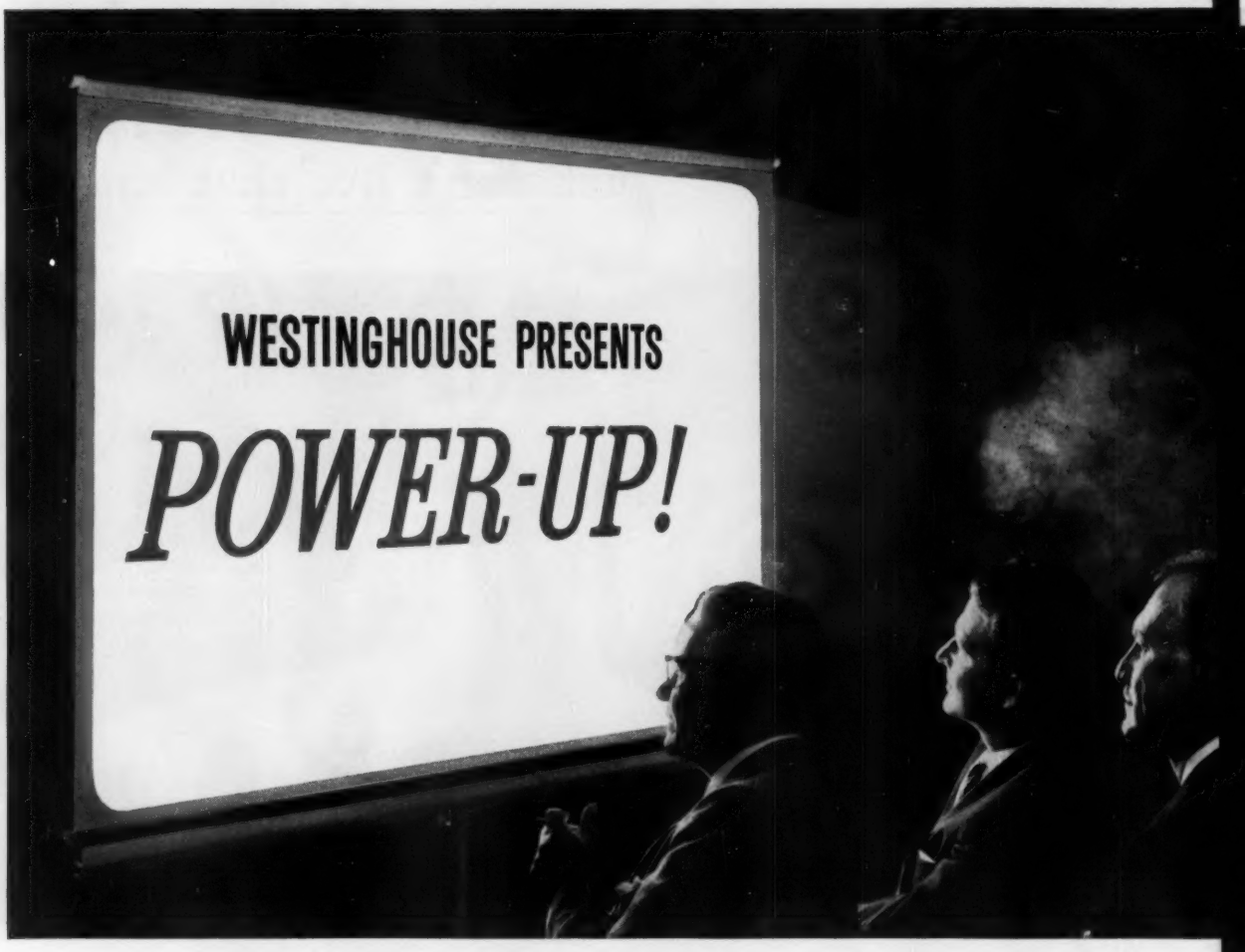
Take the No. 900 Insulator shown above, for example. It has rugged, rounded corrugations for maximum strength and resistance to impact. Cap and ball bolt are thick, husky and galvanized to withstand severe service. Scientifically fitted glaze gives added strength and added protection against contamination. Each insulator is proof-tested mechanically, then subjected to vigorous high frequency and 60-cycle flashover tests. When you buy VICTOR, you just can't buy better suspensions!



New . . . . . .
VICTOR CATALOG

Now ready for distribution is Victor's newest and most extensive catalog. One of the most complete in the field, it includes illustrations and data on many items being produced at VICTOR and not previously shown, up-to-date EEI-NEMA Standards, and an outline of VICTOR'S new plant, research, testing and manufacturing facilities. It's FREE! Write for *your* copy.

VICTOR INSULATORS DIVISION
I-T-E CIRCUIT BREAKER CO., INC.
VICTOR, N. Y.



a program of electrical service that helps your

Here's a new program of industrial service based on making future power-production estimates a reality through inter-industry cooperation. Westinghouse offers the utility industry sales aids to stimulate greater industrial electrification — sales engineers to advise on the most efficient use of electrical apparatus. To tie in more closely with the selling aims of the electric utility industry, there are special packaged meetings to show industrial customers how to make better use of electrical power. The Westinghouse Catalog of Cooperation spells out the need for this cooperation. The Handbook of Cooperation lists all the special sales aids such as technical literature and meetings that power salesmen can obtain from Westinghouse to show their customers. Ask your Westinghouse representative how you can best take advantage of POWER-UP. He will be glad to give you copies of the Handbook of Cooperation, B-7045.

industrial customers increase production...electrically

INDUSTRIAL PLANTS – ASK YOUR LOCAL ELECTRIC UTILITY TO SEE THE FOLLOWING MATERIAL:

There's Profit in Planning Your Power Distribution System

Modern Illumination Techniques

Electric Heat — Production's New Dimension

Conditioned Air — Versatile Tool for Profit

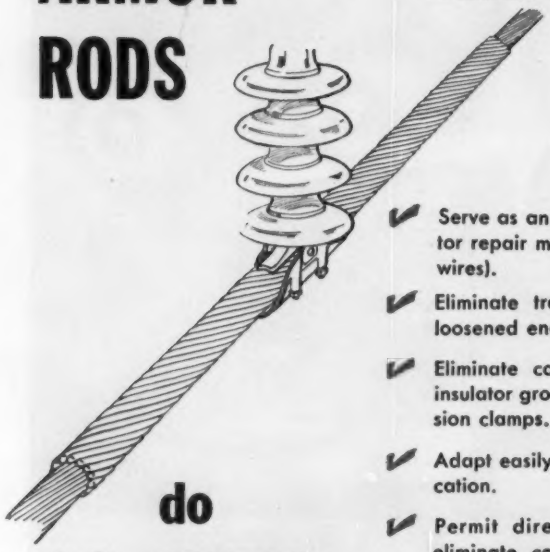
J-97207

YOU CAN BE SURE...IF IT'S Westinghouse

FANNER

Superformed

ARMOR RODS



do SO MUCH for SO LITTLE

- Have low installed cost.
- May be removed and reapplied without loss.
- Provide effective armoring with easy application.
- Eliminate field fabrication and the improper twisting or tightening of field-formed rods.
- Have built-in full length gripping power to share conductor strain under excessive loading conditions.
- Serve as an excellent conductor repair medium (for broken wires).
- Eliminate trouble caused by loosened end-clamps.
- Eliminate conductor wear in insulator grooves or in suspension clamps.
- Adapt easily to hot-line application.
- Permit direct tapping and eliminate conductor damage due to burning, over-tightening, or clamp loosening.
- Eliminate conductor pitting due to power currents attending flash-overs.
- Minimize corona formation, by eliminating irregularly shaped clamps or clips.

A FANNER EXCLUSIVE:

Packed in sturdy cartons. Armor Rod ends are color coded for easy identification of sizes up through 4/0. Write for convenient color code chart.

Licensed for use under patent No. 2,275,019

THE FANNER MANUFACTURING COMPANY

Electrical Products Division

BROOKSIDE PARK • *Established 1894* • CLEVELAND 9, OHIO

Telephone: SHadyside 1-6000

Fine Fanner Superformed

AGENTS and DISTRIBUTORS IN PRINCIPAL CITIES

Lineguards • Top Armor • Patch Rods • Fanngrips • Plastic Fannguards

Helical Spring Washers

(*Continued from page* 112)

joints. They are available in sizes from 0.25 to 0.75-in. bolt diameter for both steel and wood construction.

Eaton Mfg Co, Reliance Div., Massillon, Ohio

Distribution Transformer

This single-phase, dry-type distribution transformer, designated type DS-3, is said to have reduced sound level, decreased weight and size and improved appearance. Noise is said to be 45 db or less in 600-v class, may be somewhat higher in 5,000-v class.

Ratings range from 25 through 167 kva. Core and coils are mounted on a mechanical vibration dampening system to reduce basic sound level, permit connection to rigid conduit without noise transmission.

The insulation system is designed for 150-C temperature rise. Overall volume reductions up to 11%, compared to previous 80-C design, are claimed. Compartment for terminal boards and connection is at ambient temperature, permitting use of low temperature conductors.

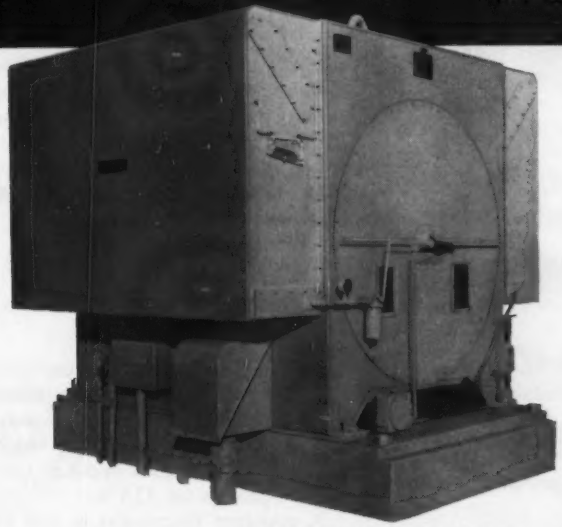
Westinghouse Electric Corp, P. O. Box 2099, Pittsburgh 30, Pa.

Wire Rope Sling

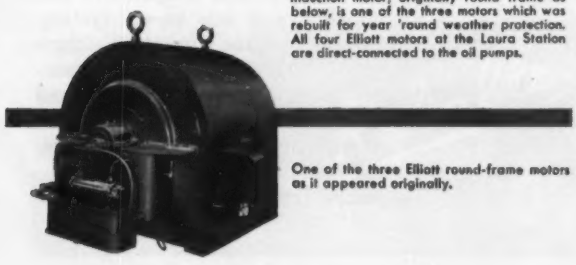
Made of 3-in. diameter 6x37 preformed improved plow steel IWRC wire rope, this sling is intended for moving heavy equipment and has a reported breaking strength of

(*Continued on page* 118)

when **ELLIOTT** weather-protected motors are installed in an Outdoor Pipeline Station!



This Elliott 1250-hp, 2-pole, squirrel-cage induction motor, originally round frame as below, is one of the three motors which was rebuilt for year 'round weather protection. All four Elliott motors at the Laura Station are direct-connected to the oil pumps.



One of the three Elliott round-frame motors as it appeared originally.

Costs Are Slashed. The outdoor structure costs far less and maintenance as well as year 'round operating costs are reduced. Besides that, Elliott motors are especially designed for safe, dependable, trouble-free operation *in all kinds of weather.*

Take the case of the Service Pipeline Company in Illinois. Rebuilding the above Laura Station as an outdoor facility, this company installed four Elliott weather-protected squirrel-cage induction motors. The station includes a canopy which gives extra protection from rain and sun—added insurance against the possibility of direct sunlight tripping the thermal devices, and provides a chain hoist for maintenance. Both the concrete slab area and the canopy extend far enough to provide ample working space around pumping units.

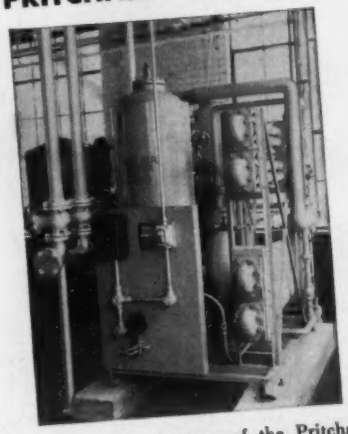
Three of the four motors, originally dripproof round-frame, were rebuilt to weather-protected designs—resulting in additional savings. Windings were given added treatment by immersing coil ends and baking. Explosion-proof bearing temperature and oil pressure relays were provided to assure maximum safety for operation in a hazardous atmosphere. These and other features of the Elliott weather-protected motors permit the erection of simplified outdoor stations instead of more costly enclosed housings. For further details, call your nearby Elliott District Office or write . . .

ELLIOTT Company

Ridgway Division • Ridgway, Pa.

R7-1

FOR EFFICIENT LOW-COST DRYING OF INSTRUMENT AND CONTROL AIR . . . CHOOSE A PRITCHARD HYDRYER



Many exclusive features of the Pritchard HYDRYER make it ideal for low-cost drying of instrument air as well as compressed air for air control systems. Features such as:

- NO WASTE—100% of all air entering the HYDRYER is dried without loss
- FULL LINE PRESSURE REACTIVATION—Pressuring and depressuring of adsorbers between cycles is eliminated
- NO PURGING—The Type A HYDRYER uses inlet main air stream for reactivation
- LONGER ADSORBENT LIFE
- NO MOVING PARTS
- SIMPLIFIED OPERATION
- REDUCED EQUIPMENT AND LINE SIZES

. . . and many other proved advantages.

Joe: This is what we were talking about. Write to Pritchard for a copy of HYDRYER Bulletin 16.0.081

Their address is-

J.F. PRITCHARD & COMPANY of CALIFORNIA
Dept. 574, 4625 Roanoke Parkway
Kansas City 12, Missouri

P.S. Get letter in the mail TODAY
Ben

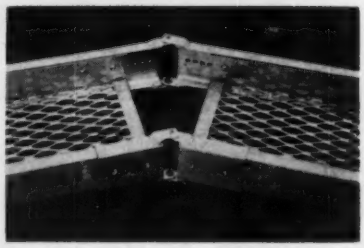
Wire Rope Sling

(*Continued from page* 116)

720,000 lb with a safe working load of 144,000 lb. The sling assembly is said to be proof tested to twice its rated safe load.

The Duraloc ending reportedly eliminates tucking, crushing, or distortion of sling body. Manufacturer claims that developed holding power increases with load and that no bursting stresses develop in collar when load is applied.

American Chain & Cable Co, Inc, Wire Rope Div, Wilkes-Barre, Pa.



Elbow Trough

Available for use with expanded metal, ladder, or solid cable support systems, this elbow is adjustable in either direction up to 90 deg. It is said to provide a flexible method of getting around pipes, columns, or other obstructions. One item fits all widths of supports. An adjustable riser fitting is also offered.

P-W Industries, Inc, Duncan & Melrose St, Philadelphia, Pa.

Air Conditioners

Said to have high cooling capacity and low power requirements, these Super-Crestline room air conditioners include a ¾-h. p. unit which draws 7.5 amp and a one-h.p. unit which operates on 115 v.

A two-step thermostat is said to maintain constant temperature and humidity with less on-off cycling. Another line, the Console Weathermaker, adapts homes or commercial establishments to year-round air conditioning by connecting to existing steam or hot water piping and replacing radiators.

Carrier Corp, Syracuse 1, N. Y.

(*More New Equipment on page* 120)

For Aluminum, ACSR Copper, Copperweld and Steel

Reliable AUTOMATIC TYPE FEED-THRU DEADENDS

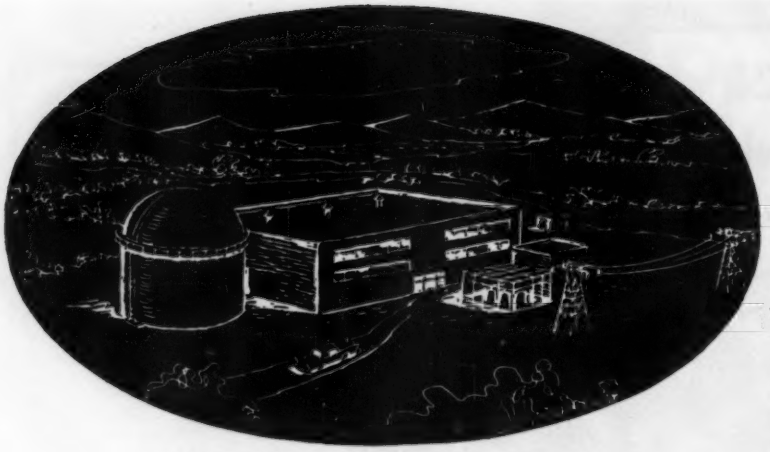
Conductors are easily run through with lowest cost and complete security.
Millions of installations, both hot and cold, have proved that Reliable Feed-Thru Deadends are completely dependable as used on copper, aluminum, ACSR or steel strand. The forged bronze, aluminum or steel gripping chuck with hundreds of forged teeth assures equal distribution of biting pressures that hold permanently.
All deadends are available with a choice of clevises.
Reliable Feed-Thru Deadends are fast, economical and 100% safe. No special tools are required for installation, excepting, of course, hot line work.

Reliable

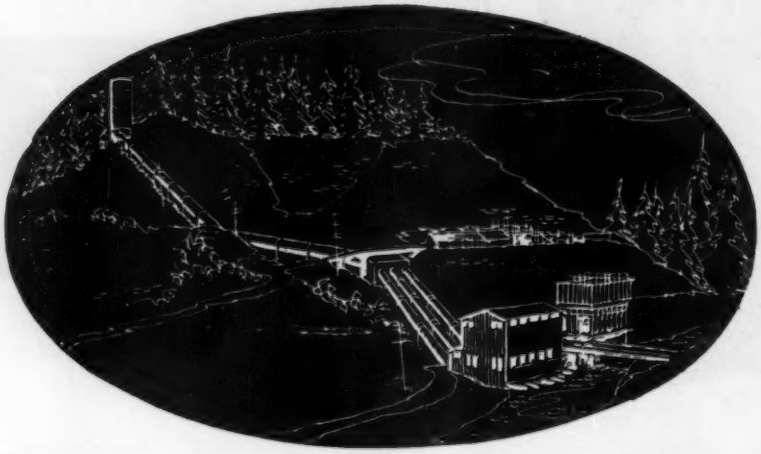
A Half Century of Service to the Utilities

RELIABLE ELECTRIC COMPANY • CHICAGO 12

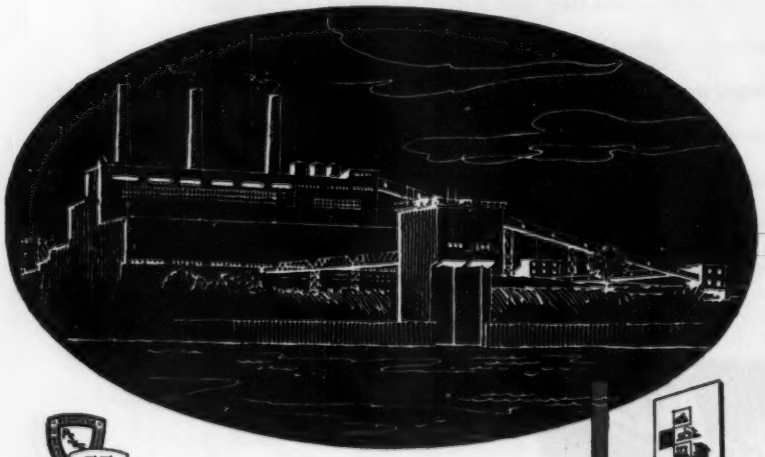
POWER LINE CONNECTORS AND CONSTRUCTION SPECIALTIES



PUTTING **POWER** INTO
YOUR EXPANDING PROGRAMS



ATOMIC, HYDRO and FOSSIL FUEL POWER PLANT DESIGN
FOR INDUSTRIALS and UTILITIES



55 YEARS

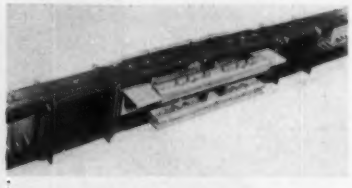
Pioneer Service & Engineering Co.
231 South La Salle Street • Chicago, Illinois

Send for our descriptive booklet, "Pioneering New Horizons" of these and other services.

Underground Cable

Said to be useful both in Type UF underground feeder and branch circuit application and in Type NMC non-metallic sheathed corrosion and moisture resistant uses, this cable is available in two- and three- conductor models. It is offered in sizes, from No. 10 to No. 14, either with or without ground wire.

Radix Wire Co, 26260 Lakeland Blvd, Cleveland 32, Ohio



Enclosed Bus Duct

In this totally enclosed aluminum feed-in bus duct, bus bars are separated and enclosed in solid sheets of insulation. Design reportedly reduces cross action and voltage drop, and produces high short circuit strength. Telescoping points, eliminate special lengths. Standard lengths are 3, 5, 7 and 10 ft long.

Aluminum lugs in cable tap boxes are said to accept either copper or aluminum cable. Duct is available in all standard ratings from 600 to 4,000 amp in 2, 3, and 4-pole models.

Square D Co, 6060 Rivard St, Detroit 11, Mich.

Paralleling Reactors

Reactors for equalizing current loads in paralleled germanium rectifier junctions reportedly reduce heat failures, overloads. For 50 C rise, type PR580 is rated 580 amp rms with convection cooling, 820 amp with 1,000-lfm forced air cooling; type PR1600, 2,500 amp with forced cooling.

International Rectifier Corp, El Segundo, Cal.

Erratum

A pocket size range finder developed by Edmund Scientific Co, Barrington 25, N. J. can be used to measure distances between 8 and 100 ft, not "8 and 10 ft" as reported in EW, April 29, 1957, page 141.

No bending problem here, because...

ROEBLING PAPER POWER CABLE WITH TELLURIUM LEAD ALLOY SHEATH HAS 4½ TIMES GREATER BENDING LIFE!

Roebling electrical wires and cables are available with either copper or aluminum conductors.

Yes, Roebling Paper Power Cable with tellurium lead alloy sheath takes that much more bending punishment than cables with copper-bearing lead sheath! And that's been proved time and again, not only in Roebling's laboratory bending fatigue test machine, in which lengths of cable are literally bent to death, but in field use over extended periods.

The uniform character of every inch of sheath and its high resistance to age-hardening, plus its unique stability under heat, assure long life under unusually severe conditions.

But there's an "inside" story to this cable, too. For the superior properties of this sheath are combined with a carefully constructed and tested inner cable made to meet the most stringent use demands. That's why, more and more, this cable is specified by name wherever cable has to last a long, long time.

Write for the full, interesting story today!

ROEBLING

JOHN A. ROEBLING'S SONS CORPORATION

Trenton 2, N. J. • Branch Offices in Principal Cities

Subsidiary of The Colorado Fuel and Iron Corporation

RACEWAY TO EXTINCTION

Concentric ring gaps in the new G-E Magne-valve Distribution Arrester whirl the power-follow-current arc to extinction in less than a half cycle, as shown in the high-speed photo above. Rotating action is produced by magnetic flux, as the current flows in coils sandwiched between the gap assemblies. This magnetic action, combined with the valve action of Thyrite* disks, gives Magne-valve distribution arresters their high protective efficiency.

*Reg. Trademark of General Electric Co. for molded resistance material.

Proved Magne-valve principle used on General Electric station and line arresters permits

SMALLEST AND MOST EFFICIENT VALVE-TYPE DISTRIBUTION ARRESTER

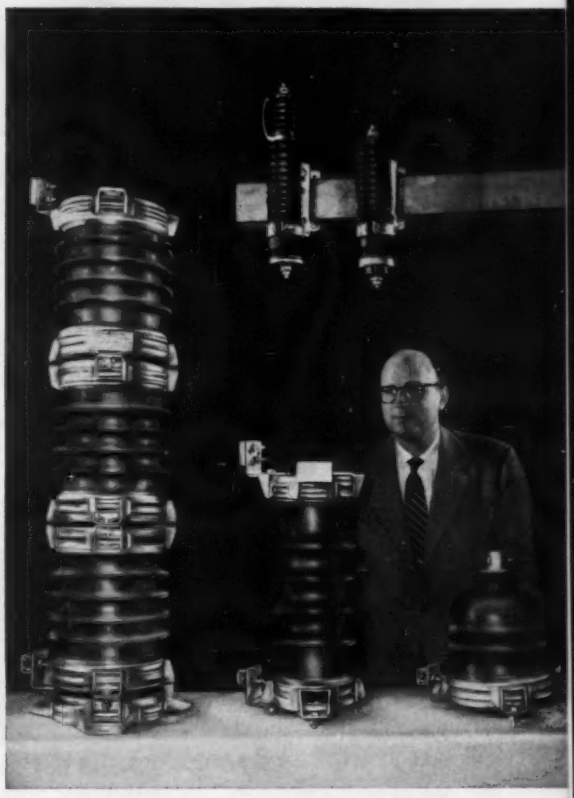
The proved magne-valve action has been packed into the smallest, lightest, valve-type distribution arrester on the market today. Some ratings are as much as 40% smaller and lighter than other makes because of the new space saving concentric ring gap design, shown on the opposite page.

Much greater protection is given by these new General Electric distribution arresters—the highest degree of protection ever offered for distribution circuits. The protective level and thermal endurance has been assured by high current tests at 100,000 amperes (5 x 10μs wave), ASA standard duty cycle tests and long duration discharge tests.

Combined valve and magnetic action, of the Magne-valve principle, assures ability to handle lightning discharges with positive extinction of the power follow-current arc after discharge.

Ratings from 3-kv through 18-kv are available in either the external-gap type or direct-connected type with ground-lead disconnector. Both types provide **positive line lock-out protection** and both are universally applicable, anywhere on the system.

For full details on the new line of distribution arresters, contact your nearest G-E Apparatus Sales Office or write to General Electric Co., Section 432-24, Schenectady 5, New York. Ask for Bulletin GEA-6379.



Magne-valve arresters for every application R. W. Frahm, Manager of Marketing—Lightning Arrester and Cutout Section, displays representative samples from the complete G-E Magne-valve line.

Progress Is Our Most Important Product

GENERAL ELECTRIC

It's NEW!

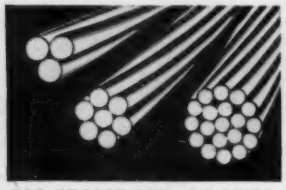
Wire that combines the strength of steel with the high corrosion resistance of aluminum

It's ACCO *Aluminized!*

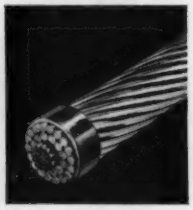
PAGE STRAND

PAGE has successfully combined two time-tested metals into a revolutionary new wire—ACCO ALUMINIZED—that has a ductile, protective coating of aluminum *bonded* to iron and steel wire by a hot-dip method. This product is covered by and is manufactured under processes covered by U. S. and foreign patents.

Now PAGE offers ACCO ALUMINIZED Steel Strand for guy wire, ground wire and messenger wire applications. Can be used with Preformed Guy-Grip dead-ends made of ACCO ALUMINIZED Wire, or with galvanized pole hardware. Here is evidence of ACCO ALUMINIZED Steel Strand's superiority: salt spray tests conducted in strict accordance with ASTM procedures show that, for equal thickness of coating, aluminized *outlasts galvanized by more than 2 to 1.*



Also... PAGE *Aluminized* ACSR CORE WIRE



Aluminum Conductor Cable with PAGE ACCO ALUMINIZED ACSR Core Wire is now available from many manufacturers of conductor cable. Product quality control is assured by a special testing procedure mutually developed by PAGE and ALCOA.

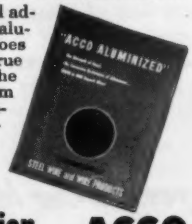
ALL STANDARD GRADES

PAGE ACCO ALUMINIZED Steel Strand is available in Common, Siemans-Martin, High Strength, Extra High Strength and Utility grades with physical properties meeting ASTM Spec. A-122-54-T and A-363-55-T.

NOTE: We will continue to make and market PAGE Stainless Steel Strand and PAGE Galvanized Strand, as heretofore, in 3-, 7- and 19-wire construction.

Send for Informative Booklet

How about ductility and adherence properties of aluminized wire? Why does aluminizing create a true duplex coating over the core? How does aluminum "sacrifice itself" to provide electrochemical protection? For answers, write us at Monessen, Pa., asking for **Booklet DH537-A.**



ACCO for Better Values

Page Steel and Wire Division
AMERICAN CHAIN & CABLE

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Bridgeport, Conn.

ACCO TRADE MARK

CATALOGS—BULLETINS

● **SMALL METAL PARTS:** A general catalog of its small metal parts—lugs, clips, terminals, and wire forms—has been issued by Zierick Mfg Corp, Beechwood Ave, New Rochelle, N. Y.

● **ZIRCONIUM AND HAFNIUM:** A 12-page booklet describing the uses of zirconium and hafnium has been published by U. S. Industrial Chemicals Co, Division of National Distillers Products Corp, 99 Park Ave, New York 16, N. Y.

● **'PACKAGE' CONTROLS:** Automatic "package" controls, suitable for industrial applications in which a chemical or mechanical function can be measured electrically, are covered in a 16-page catalog issued by Tipp-Tronic, Inc, Tipp City, Ohio.

● **POLYETHYLENE EXTRUSION:** Factors affecting quality of polyethylene extrusion are described in the March, 1957 issue of Kabelitems, published by Bakelite Co, 30 E. 42nd Street, New York 17, N. Y.

● **AC MOTORS:** Performance curves for its line of 900 frame ac motors are contained in a bulletin put out by Induction Motors Corp, 570 Main Street, Westbury, L. I., N. Y.

● **MISCELLANEOUS:** The publications listed below were published recently by General Electric Co. The address is Schenectady 5, N. Y., unless otherwise indicated:

"Fillerarc" Automatic welding equipment, its application information, product features, specifications and illustrations, are covered in GEC-1334B.

Magne-Blast Breakers—"How Magne-Blast Breakers Can Use Stored Energy" is the title of GED-3337.

Report on Ballast Sound, GED-3164 discusses GE's methods of combatting sound in fluorescent lamp ballasts.

Ballast heating is covered in GED-3328.

"Light-Up Celebrations", GEA-6462, is a bulletin designed to aid municipal officials in planning celebrations to mark the installation of new street lighting systems.

Part winding starters are covered in GEA-6606. Applies to GE's new CR7050 part-winding starter.

Positioning control—Bulletin GET-2675 is entitled "Functional Description of Numerical Positioning Control." It gives a detailed breakdown of positioning control's three major elements—data input, director and servo drive—lists features, and graphically illustrates each operation.

Two-way Radio interchangeability is discussed in ECR-458, published by the Communication Department, Electronics Park, Syracuse, N. Y.

● **RADIOACTIVITY MONITOR:** Bulletin N-57 describes the Nucligard, a combination area-personnel-equipment monitor for detecting changes in radioactivity, manufactured by Nuclear Measurements Corp, 2460 N. Arlington Ave, Indianapolis 18, Ind.

● **TAPES:** An 8-page brochure covering its tapes for sealing, splicing, jacketing and insulating has been made available by Bishop Mfg Corp, 10 Canfield Road, Cedar Grove, N. J.

(*More Catalogs on page* 127)

Your Westinghouse representative can prove . . .

NEW TD INDICATOR SIMPLIFIES TRANSFORMER LOAD MANAGEMENT

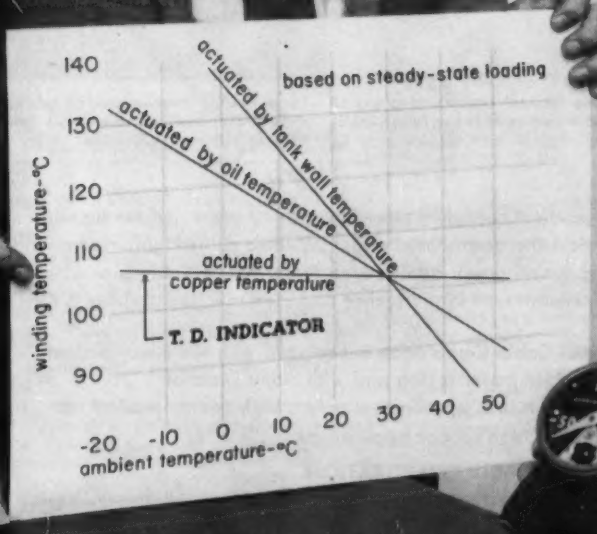
The new thermal duty indicator records total overload hours cumulatively —simplifies overload monitoring. Because it is actuated by copper temperature, you can use the full capacity of transformers. Here is a new tool for effective load management of pole-type transformers.

J-70793

YOU CAN BE SURE...IF IT'S

Westinghouse

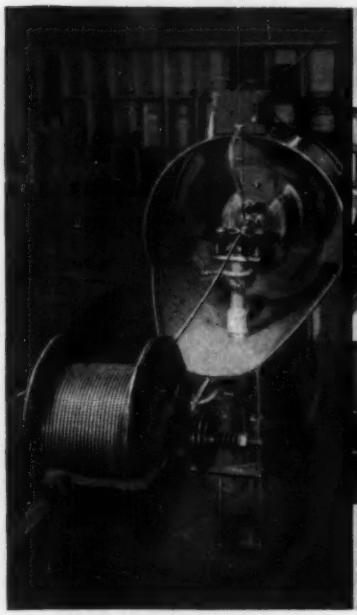
Kent Walker, manager of Distribution, South Carolina Electric and Gas Company, and Ken Leland, Westinghouse Representative.



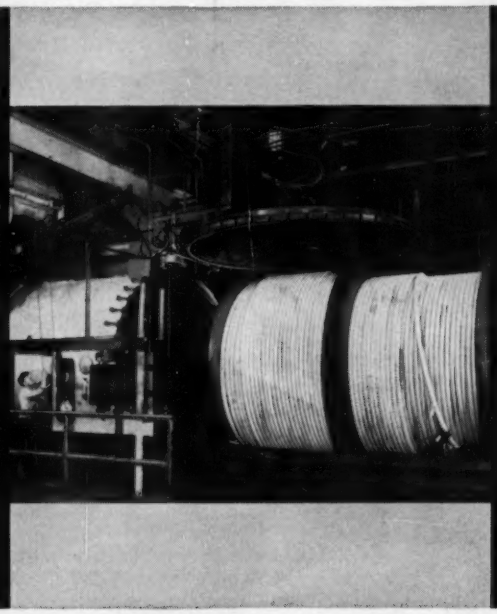
GENERAL CABLE

PAPER INSULATED
VERSATILE · RELIABLE
POWER CABLES

Manufactured at BAYONNE, N. J. • ST. LOUIS, MO. • EMERYVILLE, CALIF.



This machine forms steel strip into helical coil ducts or channels for use in gas filled or oil filled cable.



Impregnating Tank utilized in the heat-vacuum drying and oil impregnation steps in the manufacture of Paper Power Cable.

Large Cabling Machine used in cabling individually insulated conductors into multiple conductor assemblies.

- **SOLID TYPE**
- **LOW PRESSURE GAS FILLED**
- **LOW PRESSURE OIL FILLED**
- **PIPE TYPE**
  - **High Pressure Gas Filled**
  - **High Pressure Oil Filled**

The excellent operating record over many years and the superior electrical characteristics of paper insulated cable highly recommends its use for all power applications. Paper Power Cable is a predominant type in preference and use for voltages above 5 KV.

General Cable Corporation is equipped with the finest modern facilities for paper taping and with many years of know-how is in a position to supply a high quality product for all low and high voltage applications.

GENERAL CABLE CORPORATION
420 Lexington Avenue, New York 17, N. Y.
Offices and Distributing Centers Coast-to-Coast

for quality and economy... **specify GENERAL CABLE**

Catalogs—Bulletins

(*Continued from page* 124)

● **CAPACITOR UNITS:** L-M Bulletin No. PC-8, entitled "Indoor Distproof Capacitor Units and Equipments" describes what its name implies. Write Line Material Industries, McGraw-Edison Co, Milwaukee 1, Wis.

● **'PANELESCENT' LAMP:** A brochure, "Sylvania's Panelescent Lamp", details the construction and characteristics of the electroluminescent lamp manufactured by Sylvania Electric Products Inc, 1100 Main Street, Buffalo 9, N. Y.

● **SPECIALTY MOTORS, FANS:** A 14-page catalog on their specialty motors, fans and blowers has been released by Ashland Electric Products, Inc, 32-03 Queens Blvd, Long Island City 1, N. Y.

● **FILTERS:** A folder covering its line of filters and filtration systems for nuclear power and research uses is available from Guno Engineering Corp, Meriden, Conn.

● **PRECISION PRESSURE METER:** A catalog on its Press-I-Cell, an instrument for the precise measurement of absolute, gage, or differential fluid pressures, has been issued by Fischer & Porter Co, Hatboro, Pa. Ask for Catalog No. 11-102.

● **"ELECTRIONIC" CONTROLS:** Bulletin F2287-4 discusses the use of the manufacturer's "Electrionic" temperature controls for the heating, ventilating and air conditioning fields. Write Barber-Colman Co, 1400 Rock Street, Rockford, Ill.

● **ELECTRIC CLIPS:** An 8-page catalog provides a description of the complete line of electric clips made by Mueller Electric Co, 1562G E. 31st Street, Cleveland 14, Ohio.

● **WIRE ROPE RECOMMENDATIONS:** "Wire Rope Recommendations for General Contractors" describes the line of Lay Set Preformed Wire Rope made by ACCO. Ask for Bulletin DH-129-B from American Chain & Cable Co, 929 Connecticut Ave, Bridgeport, Conn.

TECHNICAL LITERATURE

POLYETHYLENE INSULATION—"Polyethylene for Higher Voltage Cables" is the title of a booklet containing information on polyethylene as an insulator and jacket material for power cable. This booklet is a reprint of a conference paper with the same title that was presented before the 1957 Winter Meeting of AIEE. The publication, designated RCT-700, is obtainable from Rome Cable Corp, Rome, N. Y.

NEMA PUBLICATIONS—The publications listed below have been issued recently by National Electrical Manufacturers Association, 155 E. 44th Street, New York 17, N. Y.:

"NEMA Standards for Metallic Rectifiers", a new revision of standards covering a wide range of products and applications in the semiconductor industry, is an amplification of the first publication, printed in 1953. Price $3.50.

Capacitors—Four revised books are available: CP 6-1957, "A-c Electrolytic Capacitors for Motor Starting," 20¢; CP 7-1957, "D-c Fixed Paper Dielectric Capacitors for General Industrial Application," 40¢; CP 5-1957, "Fixed Paper Dielectric Capacitors for General-purpose A-c Applications," 35¢; and CP 2-1957, "Series Capacitors," 35¢. Standards are given for ratings, service conditions, construction, marking, case and mounting dimensions testing and application.

Laminated Thermosetting Decorative Sheets are covered in LP 2-1957, $1.75.

Silicone Elastomer (Rubber) Coated Glass Fabric is the subject of VF 8-1957, 75¢ a copy.

Varnished Tubing and Saturated Sleeving are described in VS-1-1957 at 50¢ a copy.

X-Ray Machines are the subject of XR 1-1957. Cost: 75¢.

CONTROL & TELEMETERING—ASA has issued a 26-page booklet titled "Automation Station Control, Supervisory and Associated Telemetering Equipments." Approved by the Electrical Standards Board, the book is a standard relating to all types of devices for use in automatic switching equipment for controlling attended or unattended generating stations or substations. It does not cover equipment designed for communication circuit switching purposes. This new publication is a revision of the American Standard on the subject approved in 1945. Designated Third Edition: C37.2-1956, it was approved in October of 1956. Price is $1.30. Address American Standards Association, Inc, 70 E. 45th Street, New York 17, N. Y.

EFFECT OF GLASS BUILDINGS ON ELECTRICAL SYSTEMS—Control of solar heat gain or loss in glass-walled buildings, and control of reflected and refracted light, poses new problems in the design and functioning of electrical systems, according to research reports in a 176-page illustrated book, "Windows and Glass in the Exterior of Buildings," recently published by Building Research Institute. Book deals with problems involved with interior lighting in all-glass structures. There are also chapters on lighting as a modulator of architecture. Price is $5.00. Publication may be obtained from Publications Office, National Academy of Sciences, 2101 Constitution Ave, Washington 25, D. C.

ASTM PUBLICATION—The publications listed below have been issued recently by the American Society for Testing Materials. The address is 1916 Race Street, Philadelphia 3, Pa:

ASTM Standard on Plastics, contains 40 specifications, 93 methods of tests, 19 recommended practices and 5 definitions. 871 pages, $6.00.

Symposium on Tension Testing of Non-Metallic Materials discusses aspects of tension testing of non-metallic materials. New techniques are covered, with a critical appraisal of their merits and deficiencies. Symposium also includees five papers on testing of plastics, adhesives, rubber, wood and paper. 82 pages, $2.00.

Symposium on Solder explores the various problems in soldering. Flux, solder composition and application are covered as well as the manual, mechanized and ultrasonic techniques of soldering. Publication has 190 pages, costs $3.00.

ASTM Methods for Chemical Analysis of Metals is a part of the BOOK OF ASTM STANDARDS and contains all the Society's methods for chemical analysis of ferrous and non-ferrous metals and alloys, including spectro-chemical procedures. 640 pages, $8.00.

*Versatility

*Is the middle name of the Neale Model "K" pull type spinner . . .

- Spins new and existing cable
- Has instant adjustment from minimum to maximum cable sizes
- Spins one or two spirals
- Lashes one, two or three cables at one time
- Uses all sizes and types spinning wire
- Weighs only 36 pounds

THE MODEL "K" IS TRULY A VERSATILE CABLE SPINNING MACHINE

PLEASE WRITE FOR LITERATURE

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TOPEKA KANSAS
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MOTOR CONTROL CENTERS
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When all the costs are totaled up at the end of the job Nelson's ease of installation and compact design will let you beat the estimate.

And even that is not the whole story. Nelson's coordinated design, using components specially selected for long trouble-free service, means less maintenance cost down through the years. If saving money is important you will specify and buy Nelson motor control centers.

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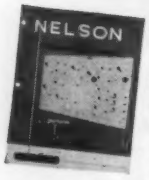
Other things are also important. The people at Nelson are interested in seeing that you have the very best workmanship. Nelson engineers with their long experience in motor control will see that your job is built to do exactly what you want it to do. Cooperative team work is more than a phrase at Nelson.



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Write for the descriptive brochure that gives you full details on Nelson motor control centers. Sizes, types, components, design features and sample specifications are all included.

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a major source of electrical control equipment for industry

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BOOKS

Books Received Since March 5, 1957

Hutte Des Ingenieurs Taschenbuch. Published by Verlag Von Wilhelm Ernst & Sohn, Germany. 876 pages, illustrated.

The First One Hundred and Fifty Years. By The House of Wiley. Published by John Wiley & Sons, 440 Fourth Ave, New York 16, N. Y. 242 pages, illustrated. Price $7.50.

Maintenance Engineering Handbook. By L. C. Morrow. Published by McGraw-Hill Book Company, Inc. 330 West 42nd Street, New York 36, N. Y. 1,528 pages, illustrated. Price $20.

Magnetic-amplifier Circuits: Basic Principles, Characteristics, and Applications, Second Edition. By William A. Geyger. Published by McGraw-Hill Book Company, Inc. 330 West 42nd Street, New York 36, N. Y. 396 pages, illustrated. Price $7.00.

Nuclear Reactors Evaluated

Atomkraft. By Friedrich Munzinger. Published by Springer Publishing House, Berlin, West Germany. 94 pages, illustrated. Price DM 10.50

This book presents a study on the technical and economic outlook for nuclear power plants. The author presents a systematic and critical evaluation of various type reactors. He concludes that the most important problems are the need to satisfactorily dissipate very large quantities of heat from small surfaces and the need to make fuel elements that will withstand surface temperatures of at least 900F.

The book is based on information in current books and periodicals. Most of these references are published in either England or the United States.

Explains Transient Phenomena

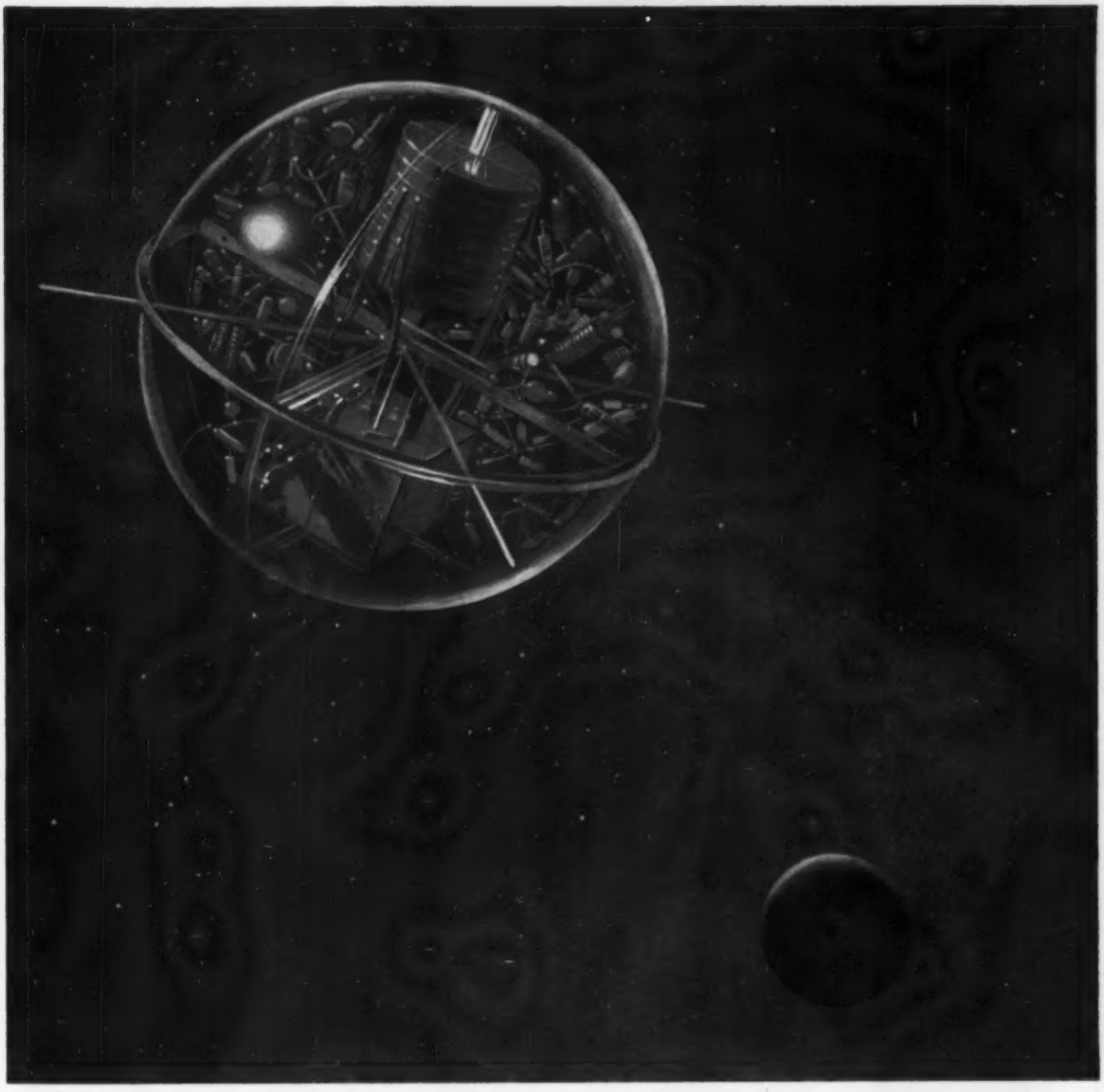
Linear Transient Analysis, Vol II. By Ernst Weber. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. 452 pages, illustrated. Price $10.50.

A highly mathematical treatment of transient phenomena in passive and active two-terminal-pair networks, in filters, and in transmission lines. The work presupposes a knowledge of functions of a complex variable, Fourier and Laplace transforms, and matrix algebra. This second volume is a continuation of the analysis of linear transient phenomena developed in the first volume.

To assist the reader the first chapter contains a review of Fourier and Laplace transforms. And appendices provide background for the other mathematical tools.

The section on transmission lines has material on loseless and distortionless lines, noninductive cables, and

(*Continued on page* 130)



Putting a voice in the man-made moon

America's first man-made satellite will soon be launched into outer space where, traveling in its own orbit, it will circle the earth.

Deep inside will be sensitive electronic instruments which will "observe" cosmic activity and "report" findings back to us. Scientists believe that many a mystery of the universe may thus be solved.

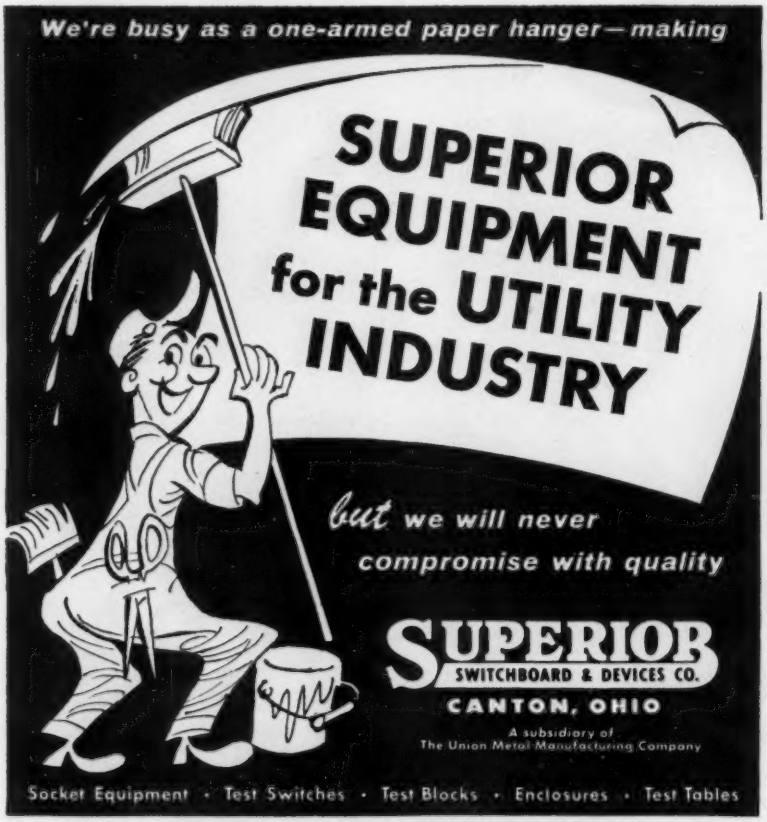
Without electrical insulation of exceptional qualities, such as CDF supplies, the equipment inside these man-made moons could never operate.

FOR SPECIFIC INFORMATION on CDF products, see Sweet's, Electronics Buyers' Guide, and other directories. Then send us your print or your problem, and we'll return free samples and technical literature.

CDF MAKES Dilecto Laminated Plastics • Celoron and Polyester-Glass Molded Plastics • Micabond Mica Products • Diamond Vulcanized Fibre • Flexible Tapes of Teflon*, Silicone, and Micabond • Resin-Impregnated Spiral Tubing • *Complete Fabrication Facilities.*

*duPont trademark for its tetrafluoroethylene resin

CONTINENTAL-DIAMOND FIBRE
A SUBSIDIARY OF THE Budd COMPANY • NEWARK 15, DEL.


We're busy as a one-armed paper hanger—making
SUPERIOR EQUIPMENT for the UTILITY INDUSTRY
but we will never compromise with quality
SUPERIOR
SWITCHBOARD & DEVICES CO.
CANTON, OHIO
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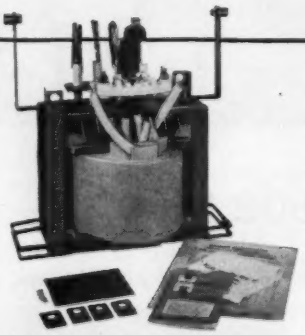
The Union Metal Manufacturing Company
Socket Equipment · Test Switches · Test Blocks · Enclosures · Test Tables

ORIGINAL FACTORY QUALITY
plus these
Money-Saving Features



- ✓ **Compact Design** permits higher kva rated assemblies to be substituted in old tanks.
- ✓ **Light Weight** facilitates installation.
- ✓ **Adjustable Anchoring Arrangement** assures accurate fit in various size tanks.
- ✓ **Specially Designed,** oil-filled metal container protects unit against moisture and damage during transit. Assembly is thoroughly dried in controlled oven, factory tested and immersed oven-hot in container.
- ✓ **Provisions for Mounting** low voltage breaker and windings to operate signal light are standard.

ALLIS-CHALMERS
Core and Coil Replacement Assemblies

Get All the Facts. See your A-C representative or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

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Books

(*Continued from page* 128)

general transmission lines. Although the author attempts to stress practical applications the very nature of the complex mathematical approach puts the practical aspects in a minor role in the book.

The book is written in a clear style and is well illustrated, but the key to the use of this book is a good understanding of the mathematical methods mentioned. Undoubtedly a very important graduate-level text book, this book will only be of marginal value to the majority of engineers in the utility industry.

Four-Pole Theory

Vierpoltheorie und Frequenztransformation. **By Torbent Laurent. Published by Springer Publishing House, Berlin, West Germany. 299 pages, illustrated. Price DM 34.50**

An explanation of the four-pole theory and its application to the solution of communication transmission circuits is present in this book. Material is also presented on frequency transformations. Numerous illustrations and examples have been included.

Some of the topics considered in the books are filters, correction networks, and amplifiers. The book was originally published in Sweden in 1948.

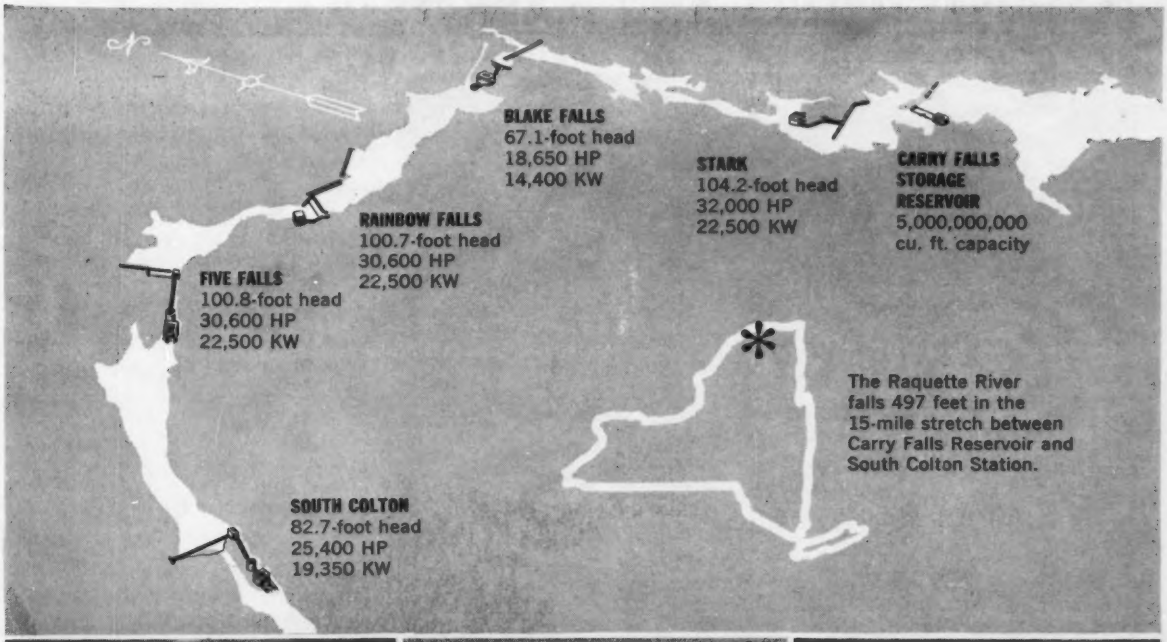
How a Computer Works

Faster, Faster. **By W. J. Eckert and R. Jones. Published by McGraw-Hill Book Co, Inc. 330 W 42nd St, New York 36, N. Y. 160 pages, illustrated. Price $3.75.**

This is an excellent "first book" for the engineer who wants to get acquainted with computers. Here in direct understandable language he can learn, in principle, how a computer works; how it adds, subtracts, multiplies and divides. The book tells how problems are presented to the computer and how the solutions are printed.

The authors explain how individual instructions are combined to solve large problems, and how the machine ties in high-speed tapes with the punched card system. How the machine checks itself and what it does when an error is detected is also explained. To illustrate the nature of calculations now being performed on electronic calculators the authors outline the arithmetical approach to a few well-known kind of problems.

It's interesting to note that the book is based on the IBM NORC designed for the Bureau of Ordnance of the U. S. Navy, because this computer, while one of the most advanced "one of a kind" calculators is particularly easy to understand.



South Colton powerhouse is typical of all 5 unattended stations. Supervisory control of automatic operation will be from Colton, 7 miles downstream.

Two SMS sliding gates with 50,000-lb. twin-drum cable hoists at Carry Falls Dam are designed for free discharge under a 58-foot head. This site can be converted to a hydro plant later if desired.

SMS self-dumping trash rakes operate directly on rack bars, ride down over obstructions and work them loose with a freedom of movement that assures fast, easy cleaning.

5 New Stations On Raquette River Equipped with SMS TURBINES AND ACCESSORIES

To further harness the Raquette River in northern New York, the Niagara Mohawk Power Corp. is now completing a series of five new power plants and a large storage reservoir. Each of these automatic, peak-load stations is equipped with an SMS-Francis turbine. SMS intake gates and twin-drum cable hoists, as well as trash rakes, are also used.

Working in close conjunction with Niagara Mohawk's engineers, SMS used two runner designs in the same basic wheel case for all five units. One runner design was used for the lower head turbines at South Colton and Blake, while another was used for the higher head turbines at Five Falls, Rainbow and Stark. This meant initial economy, and will provide operating and maintenance savings.

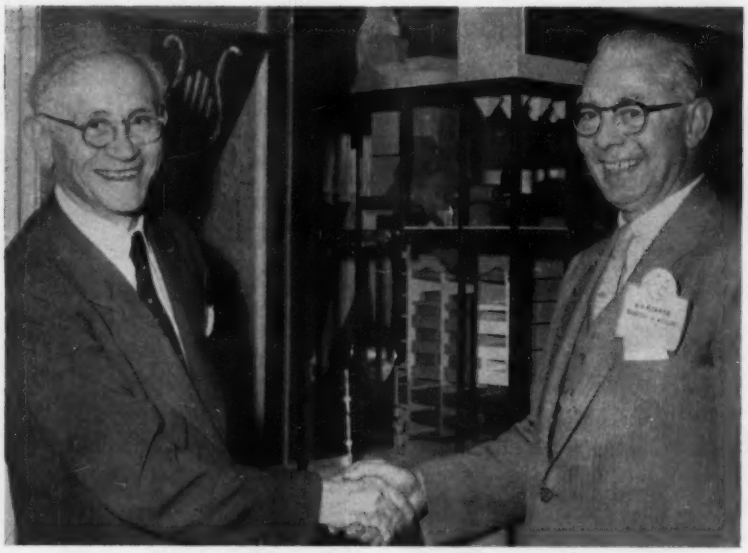
Each of the three lower stations uses self-dumping trash rakes at the turbine inlets. This design makes operation quicker and easier, cleans a greater area faster. For full information on these new trash rakes, or on other SMS accessories and hydraulic turbines, write S. Morgan Smith Co., York, Penna.

More Power To . . .

S. MORGAN SMITH SMS HYDRODYNAMICS

AFFILIATE: S. MORGAN SMITH, CANADA, LIMITED, TORONTO

Rotovalves • Ball Valves • R-S Butterfly Valves • Free-Discharge Valves • Liquid Heaters • Pumps • Hydraulic Turbines & Accessories



B&W Supplies Largest Boiler to AG&E

Philip Sporn (left), president of American Gas & Electric Co and its subsidiary, Ohio Power Co, exchanges greetings with William H. Rowand, vice president in charge of engineering, Boiler Division, Babcock & Wilcox Co. This occasion was a press preview of the supercritical once-through steam-generator at Ohio Power Co's Philo station for which B&W designed and built the steam unit.

New principles involved in the Philo unit make possible the construction of even larger capacity steam-generators for supercritical pressures. The larger units would be similar in appearance to the model (shown in background) of the 26 story-high steam-generator purchased recently by AG&E, the largest unit B&W has sold.

This model is the supercritical steam-generator B&W is building for AG&E's Sporn station. The design is for a steam capacity of approximately 3 million lb per hr with 3,625 psi at superheater outlet. It will supply a 450,000-kw turbine-generator to operate at 3,500 psi, 1050 F and double reheat to 1050F.

Allis-Chalmers Turbine Test Pit Put to Full Use

Tests on the 3,600-rpm elements of a 120,000-kw; close-coupled, cross-compound turbine-generator for Wisconsin Electric Power Co's Oak Creek Station initiated full use of the large new turbine test pit of Allis-Chalmers Mfg Co at its West Allis Works. The unit will be the station's fourth.

The pit's steam connections, condenser equipment, lubrication system, and coordinated test instrumentation can test units up to and including 250-Mw, 3,600-rpm. It is a single long opening in the main assembly area of the plant, without internal partitions or permanent platforms. Turbines can be erected in any part of it. Two 250-Mw, tandem turbines can be assembled and tested simultaneously lengthwise in the pit.

Blackburn's New Plant to Be in Production July 8

Jasper Blackburn Corp, manufacturer of electrical fittings, is ready to start operations in its new plant at 1525 Woodson Road, St. Louis (EW, May 21, 1956, p 56). Here the firm expects to be in full production by July 8, according to a company spokesman.

Blackburn's plant at 35 Madison St, St. Louis, will be closed June 14, at which time the move to the new location will be started. There will be no interruption in service to the company's customers, it is said. An open house at the new plant will be held in autumn.

Fly-Ash Collections to Be Automatic at Bergen

Automation will be a feature of the gas cleaning installation for the Bergen generating station under construction at Ridgefield, N. J., by Public Service Electric & Gas Co. Reportedly, the new station will be the first to employ an automation system for the power inputs to the electrostatic precipitators, developed by Research-Cottrell, Inc., Bound Brook, N. J.

Pilot models of the Cottrell Automation (CA) system were field tested last year at Public Service's Burlington Station.

The gas cleaning plant's two combination mechanical-electrostatic precipitators will clean 1,800,000 cfm of gas at 300F with a 98% efficiency from two steam generators supplying about 4,000,000 lb per hr of steam. The CA system will provide peak 'round-the-clock gas cleaning efficiency.

An electronic circuit for each individual electrical set will continuously monitor precipitator operation.

Microflect Reflectors

Microflect Co, Butte, Mont., has recently produced a number of passive reflectors or non-powered repeaters for microwave systems used by electric utilities in Alaska, California, Montana and Texas. One design has aluminum panels of 265 lb each and is supported for winds up to 164 mph.

(*More M & M on page* 134)

METAL-CLAD SWITCHGEAR

PURIFIED PORCELAIN in horizontal and vertical bus supports, primary disconnect bushings and caps and epoxy in bus joint covers provide excellent insulation, prevent fires in 15 kv I-T-E metal-clad switchgear. ◀

▲ **EPOXY AND SPECIAL CERAMICS** protect personnel and equipment by preventing fires in the circuit breaker section. Arc chute rear supports and blowout coils are epoxy. Jump gap cooling plates, arc chute liner plates, arc plates and spacers are special ceramics.

Only the finest fire-protective insulating materials

Nonflammable porcelain and ceramics, flame-resistant epoxy, and other flame-retardant insulating materials throughout, are among the extra values you find in I-T-E Metal-Clad Switchgear. Purified porcelain, of which the primary disconnect bushings and caps are made, also supports both vertical and horizontal bus. It is nonflammable, has high dielectric strength, won't track or deteriorate, is inherently contamination free.

Epoxy, which can be molded into complicated shapes, forms arc chute rear supports, blowout coils, bus joint covers, potential and current transformers. It has high mechanical and dielectric strength, is nontracking and extremely flame resistant.

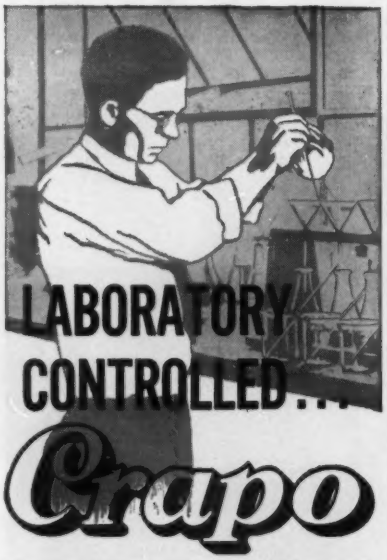
Special ceramics, highly resistant to direct arc exposure, are used in jump gap cooling plates, arc chute liner plates, arc plates and spacers. These have high dielectric strength, low moisture absorption, won't track, are excellent interrupting materials. They do not deteriorate when subjected to direct arc exposure. They absorb thermal shock and deionize gases without excessive heating.

Phenolic and polyester insulating sheets and moldings, specially treated to provide the highest possible degree of flame-retardant characteristics, are also used.

If you are planning new construction or modernization requiring electric power, consider the advantages of I-T-E equipment. Consult your local I-T-E sales office or write I-T-E Circuit Breaker Company, 19th & Hamilton Sts., Philadelphia 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY • Switchgear Division

IN CANADA: EASTERN POWER DEVICES, LTD.



GALVANIZED STEEL STRAND FOR GUY, MESSENGER and OVERHEAD GROUND WIRE

The high, uniform, consistently-dependable quality of Crapo Galvanized Steel Strand is the direct result of close laboratory control over each step in manufacture. All wires used in forming a particular size and grade are produced from steel of selected analysis, carefully processed under technical supervision and stranded on precision machines. Both wire and finished strand are subjected to prescribed laboratory tests to insure the desired end result.

Heavy, uniform, tightly-bonded zinc coatings, applied by the famous Crapo Galvanizing Process, provide maximum resistance to corrosion.

Write for booklet OG-25 containing "Sag and Tension Data for Overhead Ground Wire."

INDIANA

STEEL & WIRE CO., INC., Muncie, Indiana

Test Unit Checks Anderson's Clamps

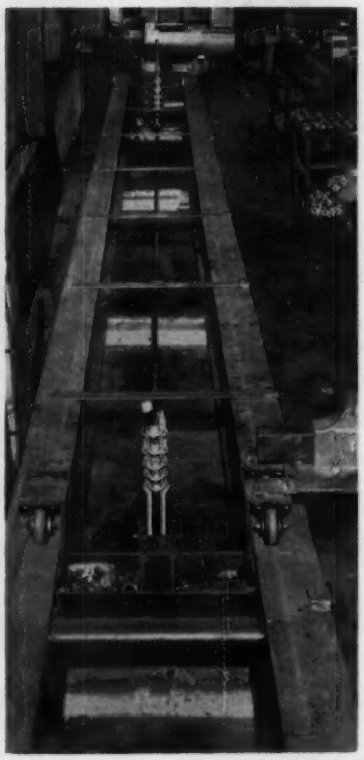
An installation of a horizontal testing machine by Anderson Electric Corp, Birmingham, Ala., will permit the company's engineers to do further research on its line of products.

This machine is designed to check the holding power and strength of electrical clamps and connectors. It has a 50,000-lb capacity and is capable of testing clamps assembled with 5-ft to 50-ft conductor lengths. Slip and pull-out factors can be accurately determined. Also, with suitable deadend arrangements, the breaking strength of the clamps can be tested when using high-strength steel cable.

Body of the machine is constructed of two I-beams with 20 in. webs. These members are set parallel 26 in. apart and tied together at the ends and at 5-ft intervals on the floor with smaller I-beams perpendicular to the large I-beams.

The hydraulic cylinder has a stroke of 3 ft. Pulling fixtures are attached to a dolly on four casters which enable it to be rolled from one end of the testing machine to the other. By means of a tube through the dolly and hole at 5-ft intervals on the reinforced web of the beam, a 2.5-in. steel shaft can be slipped through the hole and the dolly to position it in place.

Rate of stroke of hydraulic cylinder shaft and the measurement of force applied are controlled at a console at the cylinder end of the machine (far end in picture). Two twin dial gages enable an accurate measurment of the load applied up to 50,000 lb.



Argentina Wants to Buy $30 Million Plant Equipment

Buenos Aires — (McGraw-Hill World News)—The Water and Power Board (ENDE) of the Argentine Ministry of Commerce and Industry has issued a call for bids for a large number of electric generators. Offers will be opened August 14, 1957. Following items are included in the bid call:

- 180 generating sets of 500 kw each, official budget for which is 261 million pesos (this amounts to $14.5 million at the official 18 to 1 exchange rate, or $6.5 million at the free market rate of about 40 pesos to the dollar).
- 16 semi-transportable diesel-generating sets and four transportable diesel-generating sets, each of 500 kw. Budget for these is 29 million pesos.
- 70 1,000-kw generating sets, with a budget of 180 million pesos.
- 15 2,000-kw generating groups budgetted at 70 million pesos.

Specifications can be obtained for 300 pesos a set at Oficina de Talleres y Suministros, Agua y Energia Electrica, ENDE, Lavalle 1556, Buenos Aires.

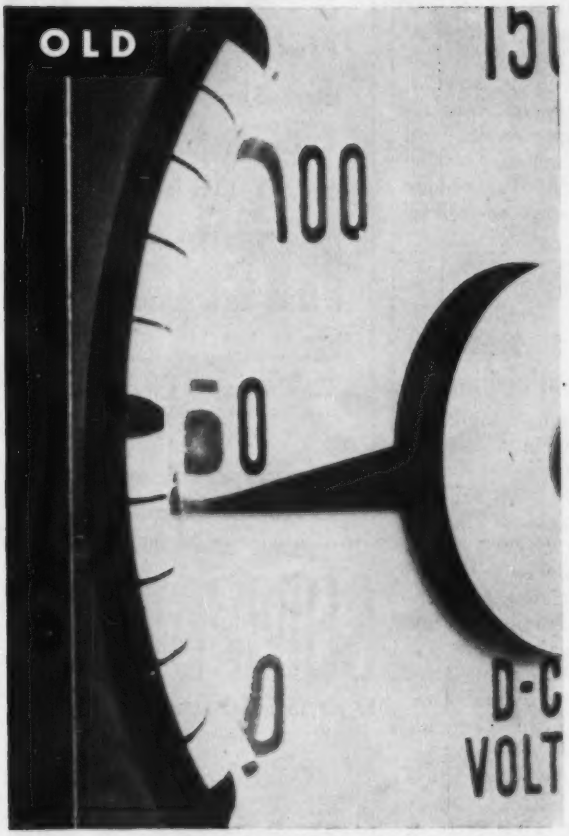
Crescent Tool Celebrates 50th Anniversary

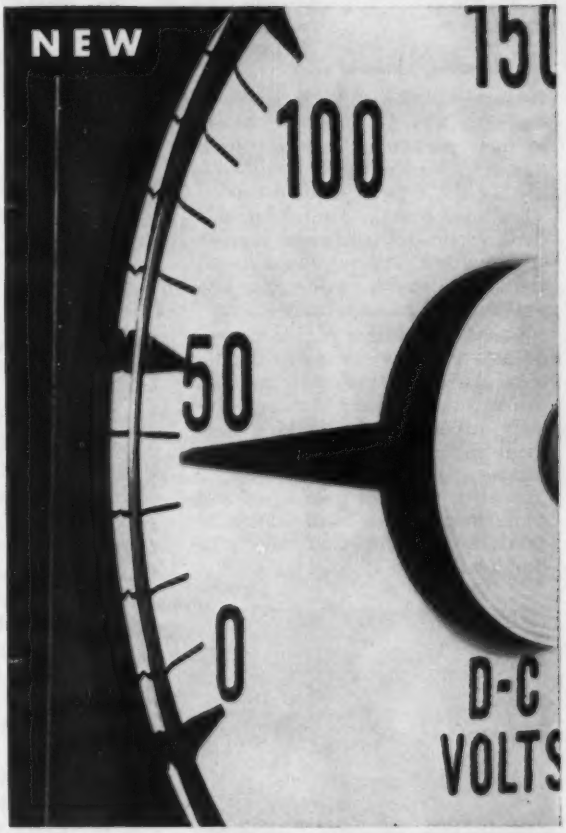
Completion and occupancy of a plant addition by the Crescent Tool Co, Jamestown, N. Y., coincided with the firm's 50th Anniversary.

(*Continued on page* 136)

No squint . . . no guess . . . no strain . . .

General Electric Switchboard Instruments Offer You Widest Angle of Readability*





*120-DEGREE ANGLE OF READABILITY (300% OF ASA STANDARDS) HELPS REDUCE READING ERRORS, SAVES OPERATORS' TIME

Switchboard instruments by General Electric offer a higher degree of readability than ever before possible . . . helping give faster, more convenient, more accurate readings.

Giving you 3 times the angle of readability established by ASA standards, they can be read easily, surely from any position around an overall angle of 120 degrees. This not only permits faster, more accurate readings on overhead or long switchboard panels, but also allows added flexibility for more economical installations.

Here's added reasons why G-E switchboard instruments are easier to read: parallax errors eliminated by placing pointer in same plane as scale . . . new, convex glass cover prevents shadows caused by overhead lighting . . . long 250-degree scales permit use of larger numerals.

General Electric offers you a complete line of switchboard instruments, including new weathertight models for outdoor panels or inside applications where there is splashing or corrosives, dust, or oil particles in the air.

For more information, contact your nearby G-E Apparatus Sales Office or write to General Electric Co., Section 582-27, Schenectady 5, N. Y. for your free copy of bulletin GEC-218E.

GENERAL ELECTRIC

Continued from page 46

The CP&L Installation

tegrated to meet the array of operating characteristics that define Central Power & Light Co.'s system: number and type of units and interconnecting tie points, fuel costs and availabilities, load patterns, tie-line limitations and so forth.

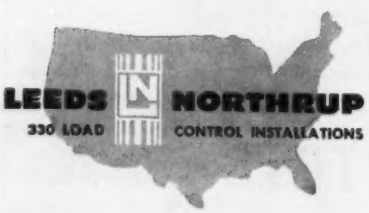
Final equipment tests at the factory were given close personal attention by CP&L engineers who subsequently proved the basic simplicity of the control system by installing it themselves.

The Dispatcher's Point of View

Because CP&L operating engineers and dispatching people were closest to their particular operating problem, they were uniquely qualified to specify the type of control needed. They knew that the control would be their responsibility in years to come, and realized that adequate instrumentation would, in the long run, pay for itself many times over.

Because operating engineers are a reliable guide when measuring the value of proposed operating improvements, you will want to make use of their experience by talking with them about your own system's operating picture. If better control is indicated, you will then move with confidence to Area Load Control by Leeds & Northrup Company, 4938 Stenton Avenue, Phila. 44, Pa.

The author, L&N's J. R. Burdine, (left) discusses console with CP&L's Ass't. Chief Load Dispatcher Melvin Barr.



Crescent Tool Celebrates

(*Continued from page* 134)

This 25,000-sq ft building, costing upwards of $250,000, is connected with the main plant by a second and third floor bridge.

The ground floor is occupied by an experimental machine shop where pilot models of new Crestoloy tools are produced and new manufacturing methods are tried out and perfected.

The second floor is devoted to packing for shipment, while the third floor houses a complete box making department. An interfloor, overhead conveyor system, continuously "offers" empty boxes and cartons of varying capacity to the second floor packers. This unique system provides storage as well as delivery.

PG&E Awards $6.5 Million Contract to Westinghouse

Electrical apparatus valued at about $6,500,000 for installation in Pacific Gas and Electric Co hydroelectric powerhouses will be supplied by the Westinghouse Electric Corp., according to Walter J. Maytham, Westinghouse vice president.

The apparatus includes: Five waterwheel generators, the two largest of which have capacities of 75,000 kva; the 230-kv power transformers for four of the new hydroelectric plants, and eleven 230-kv circuit breakers.

The equipment will go into PG&E's Upper Feather River Project plants now being built in northern California, and the Balch, Haas and Kings River plants, near Fresno.

U. S. Aluminum Production

Primary aluminum production in the United States in April amounted to 138,728 tons, according to the Aluminum Association, New York. This tonnage was 3,022 greater than in March, but about 6,000 tons less than in April, 1956. Total production for the year through April totalled 540,523 tons which is 23,255 tons short of the total for the corresponding period in 1956.

STEEL

Every Kind

Quick Delivery

Plates, Structurals, Bars, Sheets, Tubes, etc. Carbon, Alloy, Stainless Steels, Babbitt Metal.

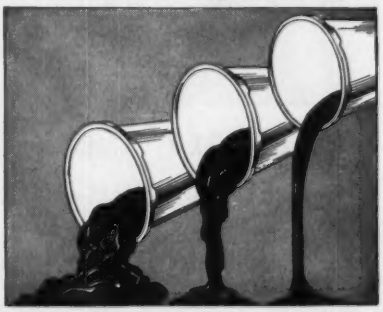
RYERSON

Plants at: New York • Philadelphia Boston • Wallingford, Conn. • Charlotte, N. C. • Cincinnati • Cleveland Detroit • Pittsburgh • Buffalo • Chicago Milwaukee • St. Louis • Los Angeles San Francisco • Spokane • Seattle

Insulating and Cable-Pulling

COMPOUNDS

of Record-Breaking Performance

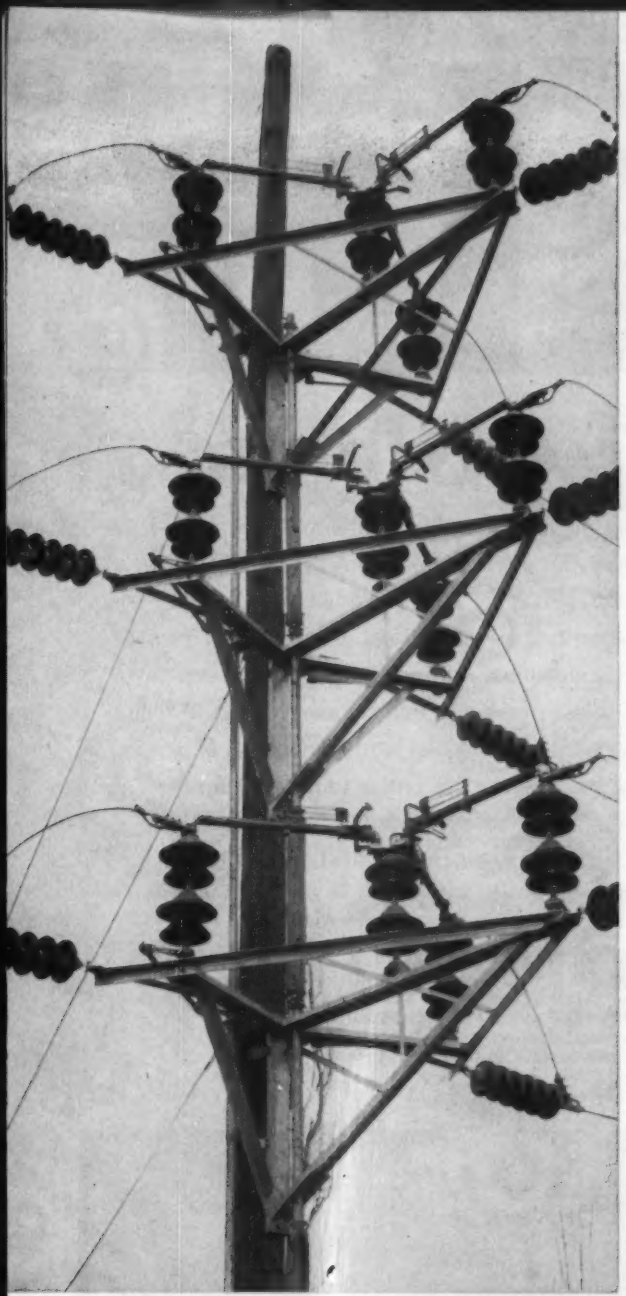


Mineralac gives you a complete assortment for every need: dense, viscous and fluid consistencies for high and low voltages in cable-joints, pot-heads, terminal bells, distribution cables, street lighting, telephone work. . . . Insoluble in oil or water, for all temperatures. Clean, safe, economical—outranks oil others in quality.

Send for new literature and prices.

MINERALLAC ELECTRIC COMPANY
25 North Peoria Street—Chicago 7, Illinois

MINERALLAC



Save your company money and improve switching efficiency by standardizing on the

NEW CHANCE GOABS

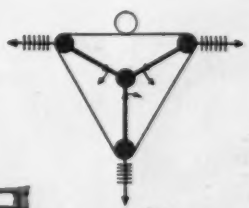
the latest advance in "packaged" switching

Many engineers have saved their companies as much as 25% on the cost of tap switching installations by using GOABS instead of conventional air break switches. GOABS require no more right of way than the pole line itself—only one pole is needed for either 2 or 3 way switching.

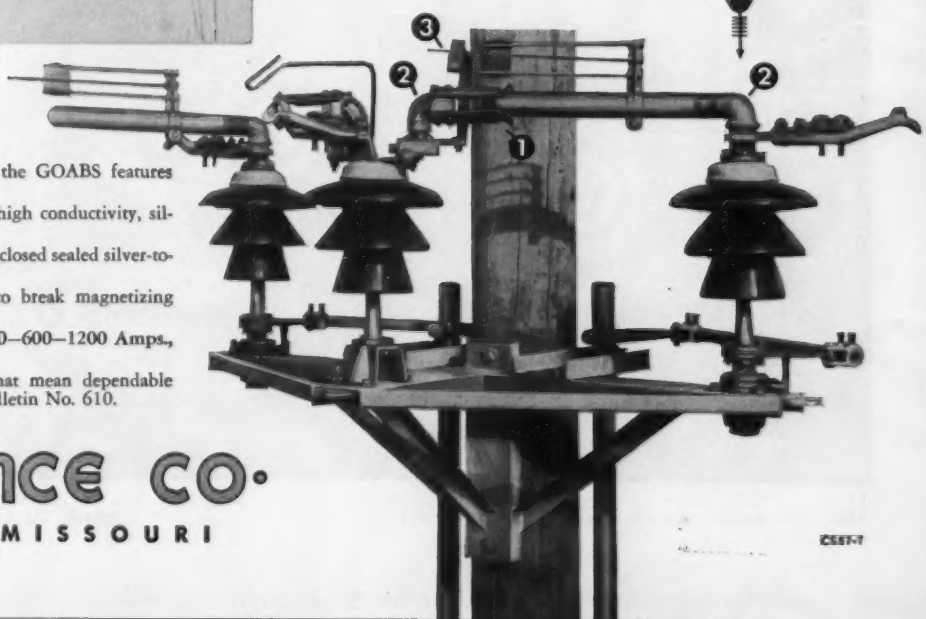
Now you can get better switching than ever before with the New type "GS" GOABS because they're built like the field proven Chance Type "S" Side Break Switches with all their finest performance features. But that isn't all—the new GOABS have fewer insulators per phase for greater savings in installation and maintenance costs... up to 30% less weight... better balance. GOABS are pre-assembled, "packaged" switches ready for mounting. This means convenience and accuracy in field installation—one piece welded frames require no bolting together. Units are balanced for easy hoisting up the pole... greaseless bearings of stainless steel require no lubrication.

Only 3 insulator stacks on 2-way switching

Only 4 insulator stacks on 3-way switching



Here is a typical 3-way installation of CHANCE Type "GS" GOABS (Group Operated Air Break Switches)



The two-way at right shows some of the GOABS features that guarantee reliable performance.

1 High pressure contacts—self-wiping, high conductivity, silver to copper.

2 Braidless Construction—completely enclosed sealed silver-to-silver hinge contacts.

3 High-Speed Snap-Out Arcing Horns—to break magnetizing and charging currents.

Full NEMA Rated—7.5 to 69 KV, 400—600—1200 Amps., 2-way and 3-way.

Plus many more important features that mean dependable performance—Get the full details in Bulletin No. 610.

A·B·CHANCE CO.

CENTRALIA, MISSOURI

CS57-7

READY

For Anything

That's the big pitch of the new Homelite Diaphragm Pump. It's ready for anything . . . ready for everything . . . always. Weighs only 120 pounds. Easy to get around fast. Can be carried and set up quickly on its sure-footed spring skids. Pumps anything from seepage to 5,000 gals. per hour. Pumps everything . . . water loaded with sand, gravel, mud, muck or goo. Built for long trouble-free life under toughest pumping conditions. Your nearest Homelite man is ready to give you an on-the-job demonstration. Write or call and he'll get in touch with you.

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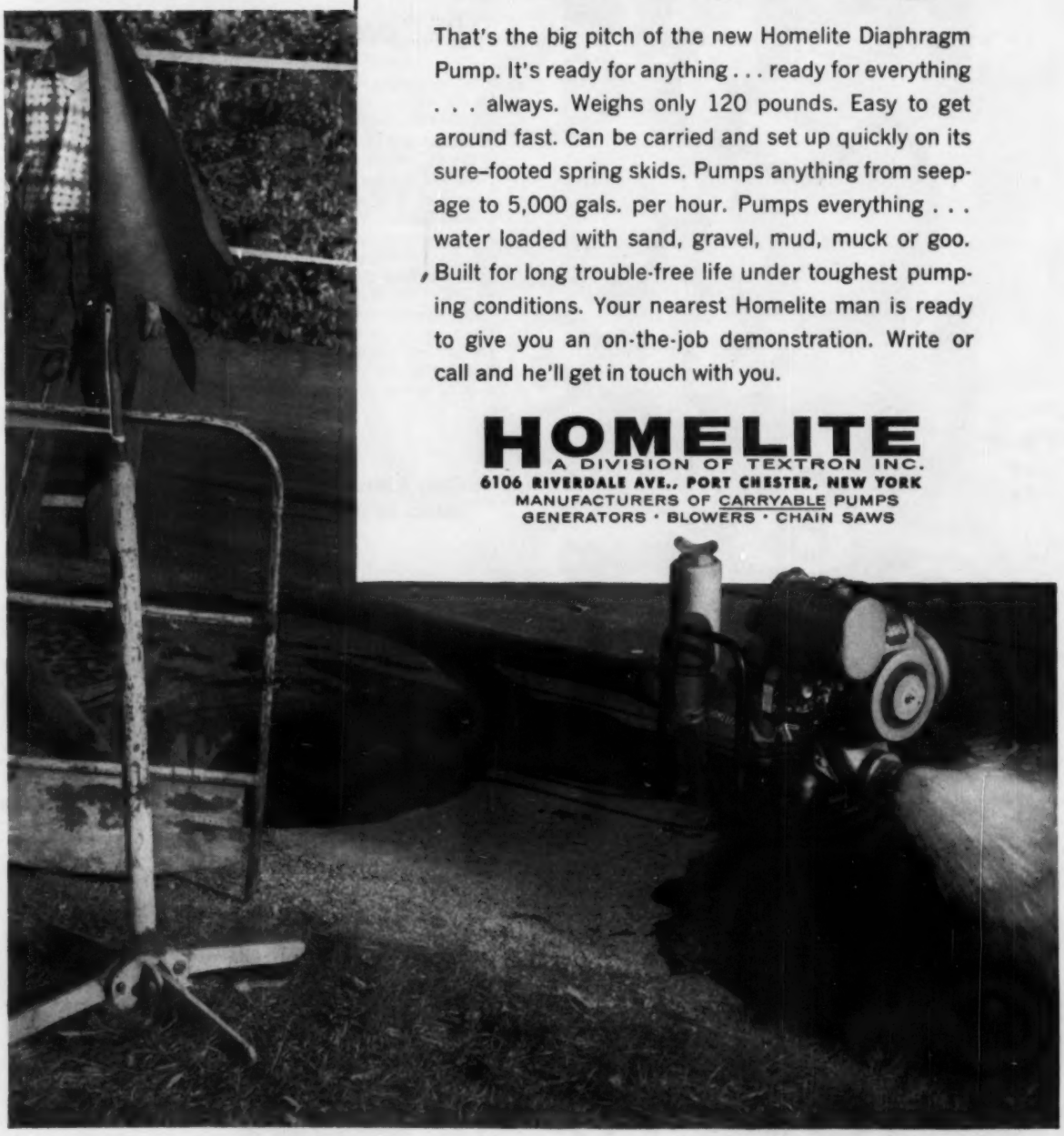
A DIVISION OF TEXTRON INC.
6106 RIVERDALE AVE., PORT CHESTER, NEW YORK
MANUFACTURERS OF CARRYABLE PUMPS
GENERATORS · BLOWERS · CHAIN SAWS



ELECTRICAL BUSINESS OUTLOOK

Electrical World
JUNE 10, 1957

Outlook for the second half of 1957 remains bright. A good guess is that Gross National Product (that's the sum of all goods and services produced) for the year will wind up about $434 billion. This compares with $412 billion for 1956, which means that business will get better as the year moves on. Current lags in some areas—housing, autos, appliances—do not add up to an over-all decline either now or later.

Government spending isn't going down, despite the economy drive in Washington. Too much of it is tied to long term commitments, to rising costs, and to the simple fact that Congress lacks control over current outlays. It's now predicted that, even in fiscal year 1958, the federal government will spend at least a $1 billion more than the President's $71.8 billion estimate.

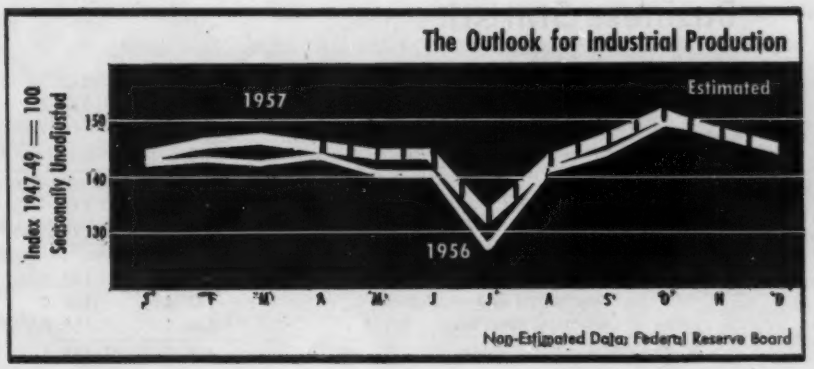
Most fears about a let-down in capital investment have evaporated. One sure sign—despite the talk a few months ago—corporations issued a record $3.8 billion in new securities in the first quarter of 1957. This was 60% more than a year ago and 20% more than the last quarter of 1956.

Consumer expenditures will keep on rising throughout 1957. Most of the gain will be in soft goods and services. But keep an eye on durables. Behind the current forecasts for auto sales—now down to 5.8 million for '57—lies the possibility of the best fourth quarter ever. And appliance sales could pick up dramatically, if the fickle consumer is so inclined. Consumer spending is now keyed closely to new products, which take time, new credit and perhaps a little salesmanship to really get moving.

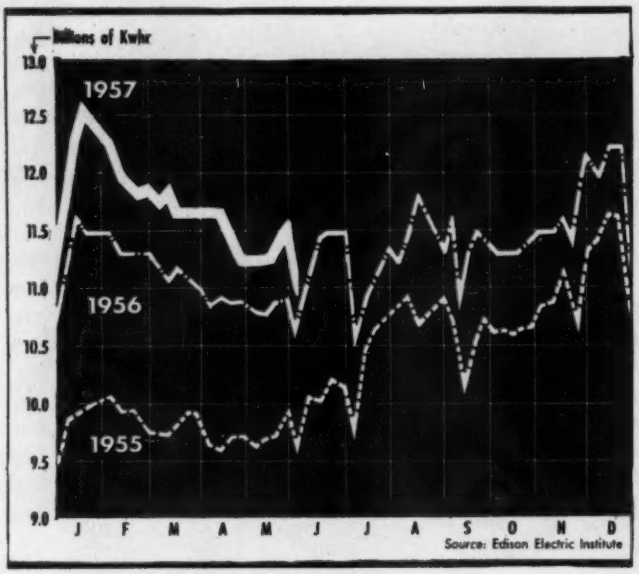
But note that some uncertain spots in the generally optimistic picture will vitally affect electric utility business. The cut in housing starts and uncertain appliance market, for instance, play big parts in the residential sales growth picture. Watch the turn of activities on these two fronts in the months ahead.

These uncertainties were reflected in the EEI power survey released late last month (EW, June 3, p 68). But it will take close study to get all the meat out of that report.

Annual load factor, for instance, is forecast to be 63.6% for this year, down to 63.4% next. But that's not the whole story. Exclude the Atomic Energy Commission load (which has a load factor of around 95%) and the industry annual load factor drops to nearer 60% for this year and the next two.



STATISTICS



OUTPUT

Week ended June 1,
10,936,000,000 Kwhr
Up 3.4%

Per Cent Change From Previous Year

	May 18	May 25	June 1
Total U. S.	+5.9	+ 5.9	+3.4
New Eng.	+4.2	+ 6.5	+2.6
Mid. Atlan.	+5.0	+ 5.6	+1.5
Cent. Ind.	+4.4	+ 5.6	+1.8
West Cent.	+7.2	+ 5.3	+3.4
Southeast	+8.2	+ 7.9	+6.0
South Cent.	+4.3	+ 4.9	+0.4
Rocky Mount.	+2.6	— 0.4	—0.6
Pacific			
NW	+6.7	+10.6	+5.7
SW	+9.4	+ 2.9	+6.1

Seasonally Adjusted Index 228.8
Week Ago 228.5
Year Ago 215.3

Atomic Energy Commission requirements—1,150,000,000 Kwhr (Electrical World estimate). Excluding AEC, output increase was 3.3%.

Power Statistics . . .

		Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity	Mar.	121.78	121.33	116.56	4.5
Peak—Class 1 Systems. million kw	Mar.	98.0	98.8	92.7	5.7
Estimated Dec. '57 Peak	Mar.	113.5	113.5	114.1	— 0.5
Production—billion kwhr	Mar.	52.45	48.67	50.34	4.2
Hydro		11.44	9.98	11.78	— 2.9
Fuel		41.01	38.69	38.56	6.4
Sales—billion kwhr	Feb.	47.78	49.15	45.41	5.2
Residential		14.25	14.44	13.06	9.1
Commercial		7.49	7.54	6.91	8.4
Industrial		23.65	24.68	23.20	1.9
Other		2.40	2.49	2.24	7.1
Fuel Consumption	Mar.				
Coal—million tons		13.84	13.21	13.39	3.4
Oil—million barrels		6.57	6.96	6.22	5.6
Gas—billion cu ft		93.15	83.24	85.17	9.4
Net Income Class A & B Co's—$ million	Mar.	126.81	142.34	116.86	8.5
Residential Customers—millions	12 mos.	45.99	45.92	44.67	3.0
Revenue per kwhr	ended	2.59¢	2.59¢	2.63¢	— 1.5
Avg. kwhr per customer	Mar. 31	3,021	3,004	2,820	7.1
Avg annual bill		$78.23	$77.80	$74.17	5.5

Business Statistics . . .

Indexes: 1947–49 = 100					
FRB Industrial Production	April	146	148	144	1.4
ENR Construction Cost	May	150.0	148.7	144.3	4.0
BLS Cost-of-living	April	119.3	118.9	114.9	3.8
New Orders for Machinery (1950 = 100)	April	147	159	149	— 1.3
NEMA Sales					
Insulation materials	Mar.	153	146	168	— 8.9
Electric appliances		97	94	120	—19.8
Wholesale prices	Mar.				
Motors and generators		140.7	140.2	126.9	10.9
Transformers and regulators		147.4	146.6	133.1	10.7
Switchgear and fuses		164.4	164.4	147.8	11.2
GNP—annual rate—$ billion	1st Qtr.	427.0	423.8	403.4	5.9%

MANAGEMENT BULLETIN

FINANCE

New security offerings by electric utilities totaled over $97.6 million last week. There were three companies that received bids on June 4 and one company postponed its offering. The first was Northern States Power Co (Wis.) which received a top bid of 99.10% for $10 million first mtg 4⅝% bonds (Aa) due 1987 from a group headed by Halsey, Stuart & Co. Later they were offered to the public at 100% to yield 4.625% . . . Second, Merrill Lynch, Pierce, Fenner & Beane and associates won 1,000,000 common shares of Virginia Electric & Power Co with a bid of $24.21 a share; reoffered at $25 a share . . . Third, First Boston Corp group won $25 million Boston Edison Co first mtg 4⅝% bonds (Aaa) due 1987 with a bid of 100.769%; reoffered at 101.55% to yield 4.53% . . . Southern California Edison Co has decided not to proceed with the sale of 1,200,000 $25 par cum preferred shares and is withdrawing its registration statement with the Securities and Exchange Commission . . . Philadelphia Electric Co is offering 609,815 common shares to its stockholders on a 1-for-20 basis, record June 4 to expire June 25 at $36.25 a share. Drexel & Co group is the underwriter . . . As EW was going to press, Georgia Power Co was getting ready to open bids on $15.5 million first mtg bonds due 1987.

Empire District Electric Co will sell $3 million 4⅞% first mtg bonds. Company gets Missouri Public Service Commission approval to sell the bonds to six insurance companies. F. H. Shelton, vice president and treasurer of the company, says: "This is the highest rate of interest Empire has had to pay on bonds in more than 25 years, and it reflects the higher money rates that have been effective for the last 12 to 18 months."

Watch for these companies to do new financing: Pacific Power & Light Co, 376,000 common shares on 1-for-10 basis to stockholders; Washington Water Power Co, $30 million first mtg bonds; Pacific Gas & Electric Co, $60 million first and refunding mtg bonds; and Wisconsin Public Service Corp, $12 million in new bonds and common stock.

Bids will be asked: City of Ellensburg, Wash., is planning to call for bids on $350,000 to $500,000 revenue bond issue, of which $150,000 will be used to buy the distribution facilities of Puget Sound Power & Light Co within the city limits.

Financing of the Columbia River Rocky Reach hydro project of the Chelan County (Wash) PUD will proceed with the sale of revenue bonds following the opening of bids June 14 on two contracts for completion of the project, according to Kirby Billingsley, PUD manager. Bids will be received for separate general and electrical contracts. General contract is expected to be one of the largest single contracts awarded in the Pacific Northwest as it will involve the general work on a substantial part of the $200-million project.

LEGISLATION

Delaware: Senate passes bill to reimburse utilities for relocation of facilities necessitated by construction of Delaware links in the interstate and defense highway network.

Texas: Gov Price Daniel signs bill to authorize electric co-ops to serve any rural area, any area which was a rural area when service was undertaken, and any area now serviced by such co-op.

Oregon: Senate refuses to accept a House-approved bill which would have provided for the creation of a State Power Commission with authority to put the state in the power business, principally as an operator and wholesaler.

California: Legislature kills bill which would have provided for regulation of all public utilities by the PUC. State Assemblyman S. C. Masterson (D-El

Sobrante), who proposed the bill, said there is no reason why public utility rates and other activities should not be regulated the same as private utilities.

Nebraska: Legislature's Judiciary Committee kills bill that would have required public power district's to pay property taxes. Power districts now pay in lieu of taxes on property acquired from private owners. Such payments equal the amount paid in taxes in the last year of private ownership.

Massachusetts: Senate rejects bills which would have required a woman member on the PUC. Under present law the governor can appoint any qualified person to the commission. However, no woman has ever been named. Rejected earlier by the Senate was bill which would have required appointment of a representative of labor to the regulatory agency.

REGULATION

An investigation of the propriety and reasonableness of rules of utilities with regard to their tariff provisions for extension of service to customers has been ordered by the California PUC. Ten utilities in the state were told to file with the PUC by next August 1, data on present free footage allowances for extensions of service; systemwide average unit costs of extensions during 1956; recommendations as to tariff provisions for gas main or electric line extension rules; and other pertinent information.

RATES

Big issue in hearings on Pacific Gas & Electric Co's application for a $19.3 million a year rate increase will be whether accelerated depreciation can be used in figuring the rate base. PG&E is also asking the California Public Utilities Commission to tie its rates to the cost of fuel oil and natural gas, allowing rates to fluctuate with these two items. Hearings will resume this week in San Francisco.

Average monthly bills for service continues slight upward trend, Federal Power Commission reports. As of Jan. 1, 1957 the average monthly bill for residential service for 250 kwhrs was $7.11, a 4¢ increase from a year earlier. For commercial service the average monthly bill for 750 kwhrs was $27.44, up 6¢ from Jan. 1, 1956. Average monthly bill for an industrial plant using 200,000 kwhrs a month was $3,235 on Jan. 1, 1957, which compares with $3,204 on Jan. 1 a year earlier. Copies of the report may be purchased from the FPC, Washington, 25, D. C. at 50¢ each. Order number is FPC R-54.

ACQUISITIONS

Seattle, Wash., City Light will be combined with the water department into a single public utilities operation if the city accepts the recommendations of Booz, Allen & Hamilton, management consultants. Some of the recommendations are: Closing of City Light's six district offices, now estimated to cost $89,000 a year, and discontinuing its subsidy on installation of ranges and water heaters, which costs $130,000 a year, and charge for installation for such equipment, which should result in income of some $40,000 a year.

Mississippi Power & Light Co will take over municipal system. Citizens of Utica vote 153 to 22 to sell its electric distribution system to the company. Pres Baxter Wilson said this about the election: "We are extremely proud of this vote of confidence extended to our company by the citizens of Utica. We pledge our full resources and facilities in providing an adequate supply of electric power to all our customers in the area and in making our maximum contribution to the development of the town."

Interstate Power Co gets Federal Power Commission approval to acquire the Peoples Gas and Electric Division from the Kansas City Power & Light Co for a base price of $16,150,515.

At Kansas Gas and Electric...

General Electric Boiler Feed Pump Motors Help Meet 41.8% Peak Load Increase

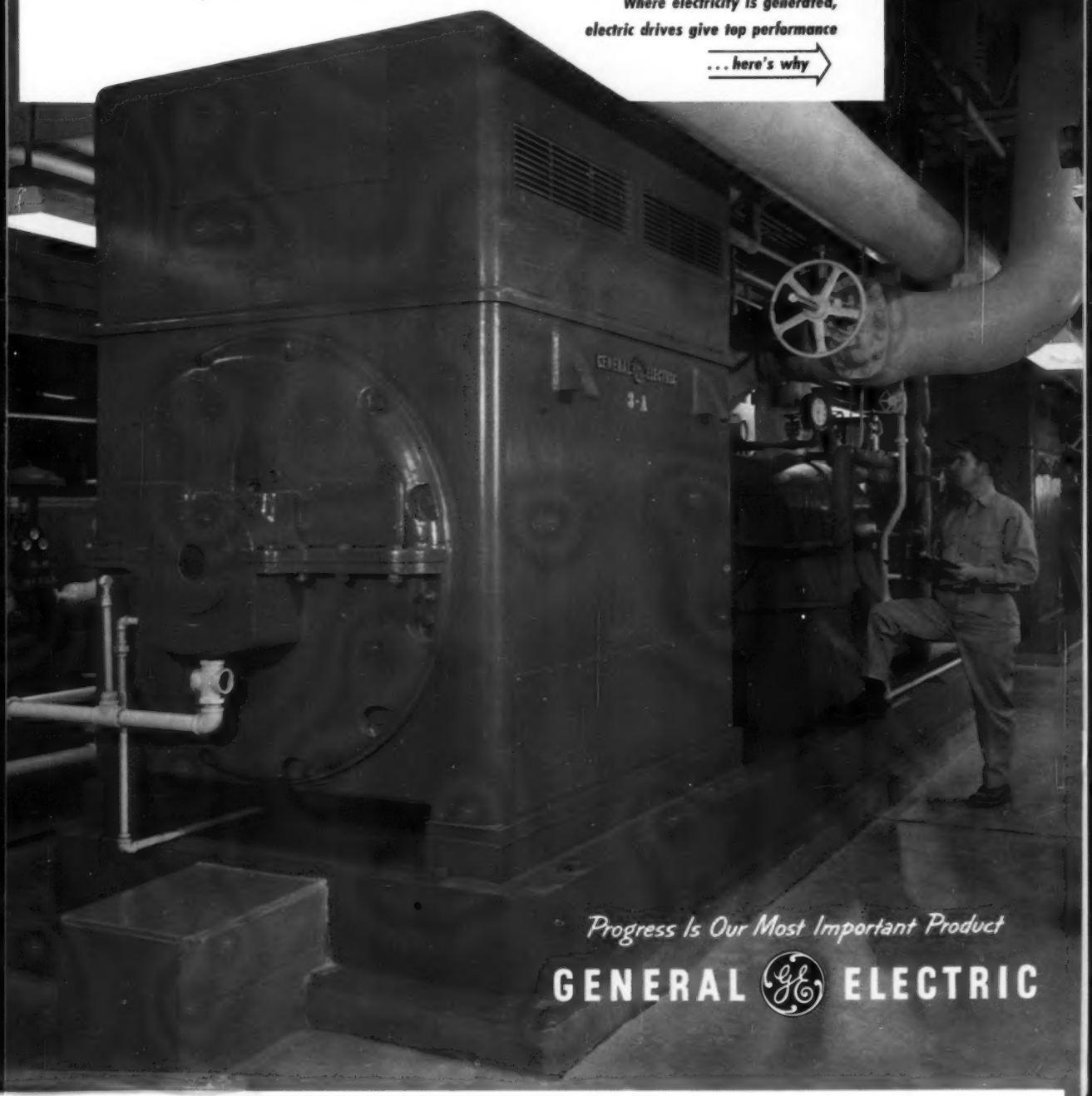
New, quiet-operating General Electric boiler feed pump motors are vital components of the G-E equipped No. 3 generating unit at K. G. & E.'s Murray Gill Station. The new unit adds over 100,000 kilowatts of production capacity to this station . . . a capacity that exceeds the total of all Kansas Gas and Electric Company plants at the end of World War II. In the past two years peak load demands on this utility have increased 41.8%.

New General Electric boiler feed pump motors help K. G. & E. meet this demand because they are designed and built to provide the higher horsepower, and the more efficient and reliable performance needed in modern power station auxiliaries. For example, new Polyex® insulation system extends motor life up to 100%. Split end shields and air deflectors facilitate bearing, coil and air-gap inspection . . . and permit the rotor to be pulled without removing the motor half-coupling. Years-ahead design features, such as the unique General Electric air pressure seal, further cut maintenance requirements . . . lengthen motor life.

Where electricity is generated, electric drives give top performance

. . . here's why

ELECTRIC DRIVES FOR THE ELECTRIC INDUSTRY

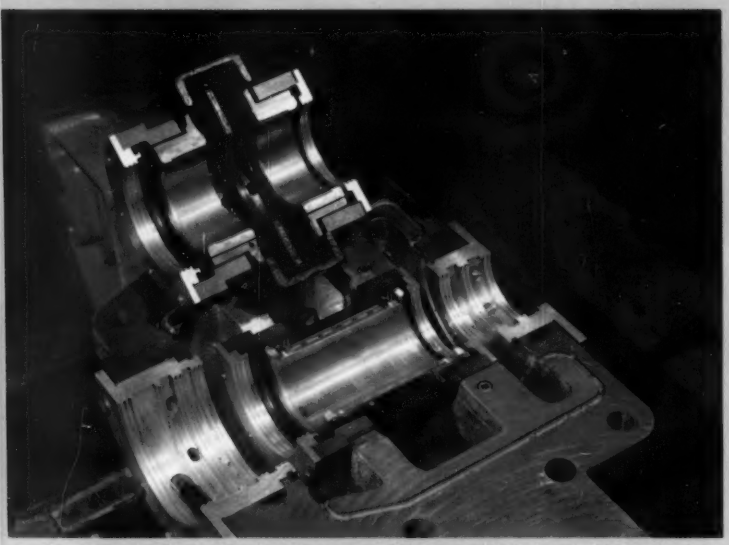


Progress Is Our Most Important Product

GENERAL ELECTRIC

ELECTRIC DRIVES FOR THE ELECTRIC INDUSTRY

Pressure-sealed bearing system extends life of New G-E Boiler Feed Pump Motors



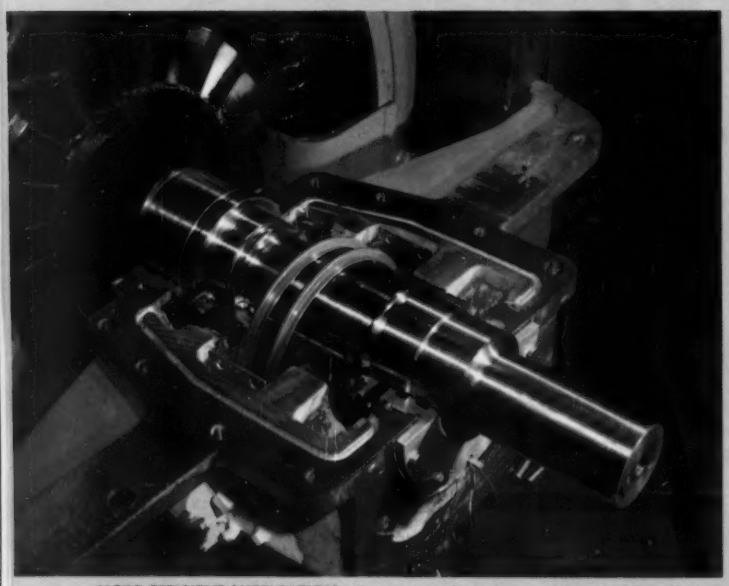
FOR LONGER LIFE—Durable tin babbit bearing lining is bonded securely to bearing shell by large, dovetail anchor grooves. Bearing shells are supported on a bearing housing integrally cast in the split end shields. Bearing length is about 1.5 times journal diameter for best distribution of pressure over entire length.

General Electric engineers have designed new G-E boiler feed pump motors to operate with maximum reliability and minimum maintenance. For example, the advanced bearing system has these outstanding features:

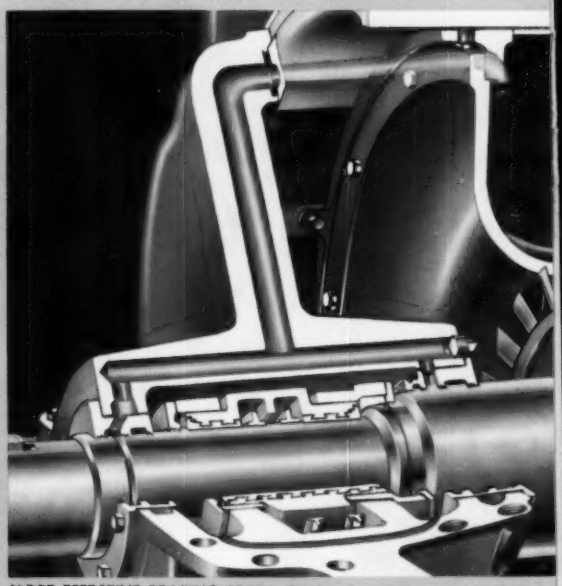
- A *triple* set of seals keeps oil in the bearing housing and better protects against entrance of dust and dirt.
- A primary oil pressure feed *and* a secondary oil ring system provide more dependable, efficient bearing lubrication.
- An oil reservoir cast in the lower half end shield utilizes a dam or weir to maintain proper oil level at oil rings.
- Rugged bearings are Kolene processed and dovetail grooved to give long-lasting bonding to bearing shell.

The carefully designed, precision-built bearing system requires much less attention than ordinary systems and adds to the service life of the new motors.

A pressure-sealed bearing system is just one of many reasons why G-E motors operate more reliably, more efficiently and economically. For complete information on General Electric's new boiler feed pump motor, contact your nearest G-E Apparatus Sales Office or write section 882-4, Medium A-C Motor and Generator Department, General Electric Company, Schenectady 5, New York.



MORE EFFICIENT LUBRICATION—A pressure oil system supplemented by oil rings provides positive low-maintenance bearing lubrication. The pressure system feeds oil directly into the bearing to lubricate and cool the surface. The oil rings, which ride directly on the shaft, draw oil from reservoir in bearing housing.



MORE EFFECTIVE BEARING SEALS—Static air pressure applied through cored passage is exerted on each side of bearing housing to provide a constant air pressure seal. This seal supplements slingers and close-running labyrinth seals.

Progress Is Our Most Important Product

GENERAL ELECTRIC

MEETINGS CALENDAR

JUNE

American Society of Mechanical Engineers—Semiannual Meeting, Sheraton-Palace Hotel, San Francisco, California, June 9-14; 21st National Applied Mechanics Division Conference, University of California, Berkeley, Calif., June 13-15.

Public Utilities Association of the Virginias—Accident Prevention Conference, Daniel Boone Hotel, Charleston, W. Va., June 14; Sales and Publicity Committee, Charlottesville, Va., June 20-21.

American Society for Testing Materials — Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, New Jersey, June 16-21.

Industrial Management Center—Fourth Annual Material Handling Training Conference, Lake Placid, New York, N. Y., June 16-29.

American Society for Engineering Education—Annual Meeting, Cornell University, Ithaca, N. Y., June 17-21.

Canadian Electrical Association—Annual Convention, Manoir Richelieu, Murray Bay, Quebec, June 19-21.

Wisconsin Utilities Association—Annual Convention, Accounting Section, Kings Gateway Hotel, Land o' Lakes, Wisconsin, June 23-25.

Michigan Electric Association—Grand Hotel, Mackinac Island, Mich., June 23-26.

American Institute of Electrical Engineers—Summer General Meeting, Sheraton Mount Royal Hotel, Montreal, Quebec, June 24-28.

American Society of Heating and Air Conditioning Engineers—Semi-annual Meeting, Manoir Richelieu, Murray Bay, Quebec, June 24-26.

• **Electric Companies Public Information Program** — West North Central Regional Group, Fort Des Moines, Des Moines, Iowa, June 25.

American Public Power Association—Hotel Biltmore, New York City, June 25-27.

National Machine Accountants Association—6th Annual Conference, Conrad Hilton Hotel, Chicago, Ill., June 26-28.

JULY

Southeastern Electric Exchange—Personnel Administration Section Conference, John Marshall Hotel, Richmond, Va., July 25-26.

AUGUST

Western Electronic Show and Convention — Annual Meeting, Cow Palace, San Francisco, Calif., August 20-23.

American Institute of Electrical Engineers — Pacific General Meeting, Yakima, Washington, Aug. 26-30.

SEPTEMBER

American Institute of Electrical Engineers—2nd Special Technical Conference and Exhibit on Magnetic Amplifiers, Hotel Penn Sheraton, Pittsburgh, Pennsylvania, September 4-6; Sixth Annual Industrial Electronics Symposium, co-sponsored with Institute of Radio Engineers, Morrison Hotel, Chicago, Ill., Sept. 24-25.

Instrument Society of America—12th Annual Instrument Automation Conference and Exhibit, Cleveland Auditorium, Cleveland, Ohio, Sept. 9-13.

Illuminating Engineering Society — National Technical Conference, Biltmore Hotel, Atlanta, Ga., Sept. 9-13.

Maryland Utilities Association—33rd Annual Fall Conference, Cavalier Hotel, Virginia Beach, Va., Sept. 13-14.

Edison Electric Institute — Accounting Division Organization Meeting, jointly with AGA, Lemington Hotel, Minneapolis, Minn., Sept. 19-20; Industrial Relations 10th Annual Round Table Conference, Drake Hotel, Chicago, Ill., Sept. 23-25; Meter & Service Committee, Hotel Nicolet, Minneapolis, Sept. 23-25; Electrical Systems and Equipment Committee, Cosmopolitan Hotel, Denver, Colo., Sept. 30-Oct. 1.

Public Utilities Association of the Virginias — 39th Annual Meeting, White Sulphur Springs, West Virginia, Sept. 20-21.

American Society of Mechanical Engineers — Fall Meeting, Statler Hotel, Hartford, Conn., Sept. 23-25.

Electric Companies Advertising Program—Copy Group Meeting, Detroit, Mich., Sept. 25.

Electric Companies Public Information Program — Workshop Conference, Whittier Hotel, Detroit, Mich., Sept. 25-27.

OCTOBER

Pennsylvania Electric Association — 50th Annual Meeting, Bellevue-Stratford Hotel, Philadelphia, Pa., Oct. 2-3.

Indiana Electric Association — French Lick-Sheraton Hotel, French Lick, Ind., Oct. 2-4.

International Association of Electrical Leagues—Annual Conference Sheraton-Gibson Hotel, Cincinnati, Ohio, October 2-5.

National Industrial Conference Board—Atomic Energy Course for Management, Hotel Moraine on the Lake, Highland Park, Ill., Oct. 6-12.

• **American Society of Mechanical Engineers** — Lubrication Conference, sponsored jointly with American Society of Lubrication Engineers, Royal York Hotel, Toronto, Canada, Oct. 7-9; Power Conference, Americus Hotel, Allentown, Pa., Oct. 21-23.

National Electronics Conference, Inc—Hotel Sherman, Chicago, Ill., Oct. 7-9.

American Institute of Electrical Engineers—Fall General Meeting, Morrison Hotel, Chicago, Ill., October 7-11.

Edison Electric Institute—Area Development Workshop, Phoenix Hotel, Lexington, Ky., Oct. 10-11; Transmission & Distribution Committee, Statler Hotel, Boston, Mass., October 17-18; Accounting Division Taxation Accounting Committee, held jointly with AGA, Williamsburg, Va., Oct. 23-24.

Interstate Power Club—Hotel Martinique, NYC, Oct. 14.

National Association of Railroad, Utilities Commissioners—Annual Convention, Peabody Hotel, Memphis, Tennessee, October 28-31.

• **Institute of Radio Engineers**—3rd Annual Technical Conference of the Professional Group on Electron Devices, Shoreham Hotel, Washington, D. C., Oct. 31-Nov. 1.

• Additions this week.

Maine PS Elects Collins, Stetson to New Posts

COLLINS

STETSON

C. Hazen Stetson has been elected to succeed Samuel W. Collins as president of Maine Public Service Co. Collins has been named chairman of the board.

Stetson has been executive vice president since last summer and previously served as vice president for five years. He first joined the utility in 1937 as chief clerk. In 1946, after four years at Central Indiana Gas Co, he returned to Maine Public Service as assistant treasurer. He served as secretary and clerk from 1947 to 1951 and in 1948 his duties were expanded to include those of treasurer. He became vice president in 1951.

Collins, who has served as president of Maine PS since last summer, has been a director of the utility since 1947.

Officers Are Elevated by Mississippi Valley PS

In recent executive appointments, Mississippi Valley Public Service Co elected E. H. Finkelnburg board chairman, S. J. Pettersen president-general manager, and N. J. Fischer vice president-operations.

Finkelnburg, president since 1951, has been affiliated with MVPS since 1918. He advanced steadily from his first post of electrical engineer and became vice president and general manager in 1943.

Pettersen has served as executive vice president for six years. He began his career with the utility as a storekeeper in 1928. He rose to assistant auditor in 1931 and treasurer and assistant secretary in 1938. In 1948 he became vice president, treasurer, and a director.

FINKELNBURG

PETTERSEN

FISCHER

Fischer, who joined MVPS 10 years ago as electrical engineer, has been assistant general manager since 1953.

Also promoted were G. A. Des Rosier, to chief engineer and power superintendent, and John L. Carroll, to treasurer-assistant secretary.

JAMES F. CRIST

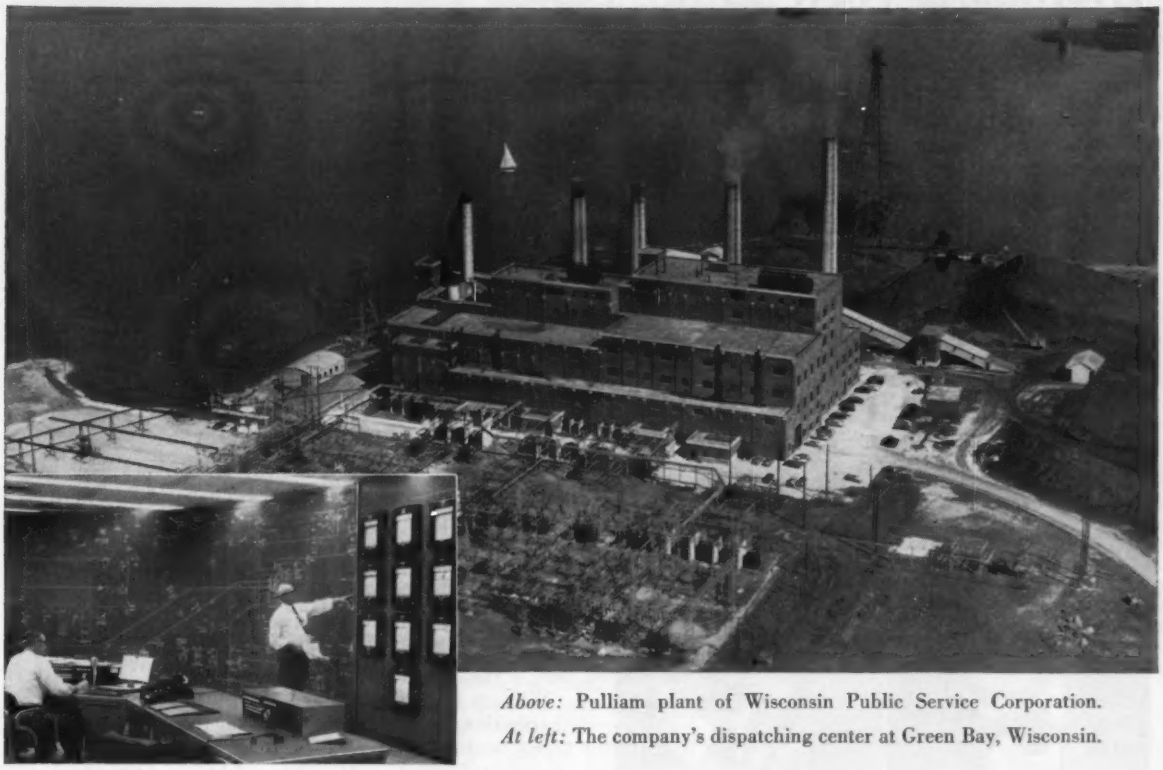
Crist is Named to Head SEGC

New president of Southern Electric Generating Co is James F. Crist, vice president of the Southern Co since 1947. He succeeds Herbert J. Scholz, chairman of the board of Southern Services, Inc, who has retired. Scholz will be retained as an independent consultant.

During his 31-year utility career, Crist has also been a vice president of South Carolina Power Co and is a former president of Gulf Power Co.

SEGC, which he will now head, was formed to build and operate power facilities. It is owned by Alabama and Georgia Power Co, both Southern Co subsidiaries.

BELL SYSTEM PRIVATE LINE CHANNELS SERVE THE POWER INDUSTRY



Above: Pulliam plant of Wisconsin Public Service Corporation.
At left: The company's dispatching center at Green Bay, Wisconsin.

Why Wisconsin Public Service gets better communications for less money

Until a few years ago Wisconsin Public Service Corporation provided most of its own communications services. But the company was growing fast. As its communication needs increased, WPS asked Bell System engineers to study the overall problem.

As a result, the power company reached the following conclusions:

1. It would cost less to lease Bell System services than to carry the charges on current and proposed communications facilities.

2. WPS technicians who had always been tied to communications assignments could be released for vital jobs in generating, transmitting and distributing power.

3. Expansion would be simpler; equipment would be kept up to date.

4. Telephone transmission would be reliable and of high quality.

Now Wisconsin Public Service has one of the most modern communication systems in the power industry. The company uses private line telephone for centralized load dispatching and private line channels for remote metering, protective relay and supervisory control.

A Bell System representative stands ready to study your communications needs—and to work with you in developing faster, more efficient communications. Just call your Bell Telephone business office.

BELL TELEPHONE SYSTEM

PRIVATE LINE TELEPHONE • PRIVATE LINE TELETYPEWRITER • DATA TRANSMISSION SYSTEMS
CHANNELS FOR: REMOTE METERING AND CONTROL • TELEPHOTOGRAPH • CLOSED CIRCUIT TV

Thomas is New VP at Texas P&L

Texas Power & Light Co has announced the election of T. D. Thomas as a vice president of the utility.

The 37-year Texas P&L veteran most recently served as chief engineer. He joined the utility's appraisal section in 1920, immediately after earning his mechanical engineering degree from Rice Institute. Six years later he was appointed to head the appraisal section. In 1932 Thomas was placed in charge of the engineering department's design section and was named chief engineer in 1939.

T. D. THOMAS

Bailey and Flynt Advance to New Positions

BAILEY FLYNT

Emory P. Bailey, former general manager of Weymouth Light & Power Co, has been named to an administrative post with Yankee Atomic Electric Co.

Bailey has been with New England Electric System, of which Weymouth is a subsidiary, since he graduated as an electrical engineer from University of Maine. He served for a time with the Mystic Power and Narragansett Electric Cos. In 1948 he became manager and then a vice president of Weymouth L&P.

William N. Flynt, former general superintendent of distribution of NEES properties in the Mystic, North Shore, and Merrimac Valley areas, now becomes manager at Weymouth. Also a U. of M. graduate, he has held various engineering posts during his NEES career.

PERSONAL BRIEFS

William J. Downey and **Geoffrey J. Redmond** are newly named executive assistants of Public Service Electric & Gas Co. They will serve in the Hudson and Bergen Divisions, respectively.

Robert H. Dulaney has succeeded retiring **Noble J. Simmons** as secretary and comptroller of the Electric Power Board of Chattanooga.

Western Light & Telephone Co, Inc, has advanced **R. Gordon Sutton** to commercial manager of the Southern Electric Division. . . . At Mississippi Power Co, **James C. Herring** has been named plant superintendent of the new Gulf Coast generating plant now under construction.

Charles B. Bennett, former director of planning for Los Angeles, has been appointed consultant for the worlds' first solar energy center at Tierra del Sol, Calif.

Georgia Power Co's **Roy D. Benson** is now manager of the newly created advertising and display division, sales department. . . . **Oscar H. Lashley, Jr,** has assumed the new position of assistant commercial lighting supervisor at Potomac Edison Co.

Connecticut Light & Power Co has designated **Robert I. Coleman** as Northern Division manager and **Charles S. Beach** as manager at Winsted.

Baltimore Gas & Electric Co's Electric Division has made the following appointments: **Thomas W. Trice,** general superintendent, electric operations; **James U. Baley,** assistant to general superintendent, electric operations; **Thomas E. Marburger,** general superintendent, electric engineering and construction; **William J. Witte,** assistant to general superintendent, electric engineering and construction; **Douglas F. Horstman,** assistant superintendent, building construction; **John F. Hennessy,** assistant superintendent, electric distribution; **William E. Wilkinson,** assistant superintendent, electric distribution; and **William P. Beyerle, Jr,** assistant superintendent, power production stations.

Cleveland Engineering Society has as its new president **Willard C. Brown,** manager of application engineering, General Electric Co.

Anaconda Sales Co has appointed **Herbert M. Weed** as assistant to the executive vice president. . . . **Joseph N. Kemple** was recently named sales manager, Page Steel and Wire Division, American Chain & Cable Co.

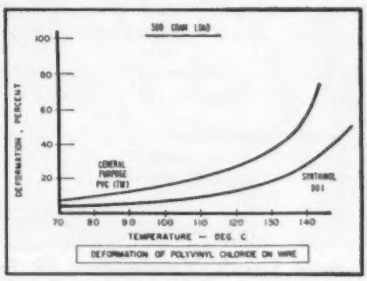
ADVERTISEMENT

An unusual polyvinyl chloride compound

CURRENT TRENDS

No. 10 in a series of articles

Polyvinyl chloride (PVC) compounds have been widely used in the wire and cable industry. These compounds have many useful properties and have found wide application as insulations and sheaths. These properties and applications were discussed in Current Trends No. 4, entitled "Progress Report on Polyvinyl Chloride Insulations." Like most materials, the conventional PVC compounds have limitations, and there are many applications where these weaknesses have prevented taking full advantage of the good features. This discussion is about a special PVC compound, which was designed and developed in an effort to incorporate into a single compound as many desirable properties as possible. Known as Synthinol 901, this compound was developed in the laboratories of the Rome Cable Corporation, Rome, New York. Today Synthinol 901 is being used as insulation and sheath for wires and cables in many applications where conditions of installation or use require properties not to be found in conventional PVC compounds.



Graph shows heat deformation vs. temperature, and compares Synthinol 901 with conventional Type TW compounds. Test run in accordance with Underwriters' Laboratories standard procedure, except for temperature.

Shortly after World War II, the Underwriters' Laboratories established the need for a PVC insulated wire suitable for wiring appliances where an operating temperature rating of 105 C was required. Rome Cable laboratory attacked the problem of developing a PVC compound to meet U/L requirements. The laboratory was also given a list of desired additional properties for incorporation into this compound. This project assignment was completed in 1949, at which time Rome Cable introduced Synthinol 901. Since 1949 this compound has provided the solution to a rather impressive list of tough wiring problems.

True, there are many 105 C PVC compounds available today; there are likewise compounds available which possess one or more of the individual properties on the list describing Synthinol 901. What is unusual is that here, for the first time, was a single PVC compound which possessed all of these superior properties and which also retained all of the properties found in conventional PVC materials.

Rather than presenting data and charts, it is believed that the practical value of this compound is better illustrated by relating a few of the concrete results of eight years of continuous work with users who have had difficult problems. These case histories are all a matter of record.

1. Oil refinery, industrial and chemical plant wiring.

Plant and oil refinery engineers had long used Type TW for plant wiring. Results were good, but too often the heat deformation characteristics of conventional TW caused trouble in warm locations. Since one of the outstanding properties of Synthinol 901 was its superior resistance to deformation, this material was tried, and soon became widely used because of its much better record in service. During several years of experience Synthinol 901 proved to have chemical and solvent resistance so superior to conventional materials that it came into wide use where this resistance was needed. In these industrial applications, which are not under the jurisdiction of the National Electrical Code, the higher temperature ratings have made possible appreciably higher current carrying capacities, with consequent savings.

In chemical plant wiring the corrosive action of chemicals and solvents has always been a tough problem. Although PVC has inherently better resistance to chemicals and solvents than many other materials, engineers desired further improvement. One user ran a series of long time tests with samples immersed in various solvents, acids, and alkalis. The results clearly showed that Synthinol 901 would give longer life than other PVC compounds, when exposed to these chemicals.

2. Oil-filled transformers.

Transformer engineers have long been searching for a cable construction to replace the varnished cambric-insulated cable used for high voltage and tap changer leads in oil-filled transformers. One transformer manufacturer, encouraged by successful experience with Synthinol 901 in other applications, began a comprehensive study of this insulation in lieu of VC on these high voltage leads. In operation these leads are immersed in the transformer oil at elevated temperatures. This test program extended over several years, and included evaluation of almost every conceivable effect of Synthinol 901 on the life and performance of the transformer. These engineers came up with the following reasons for standardizing on Synthinol 901 for this application:

1. There was less sludge in the oil than when VC insulation was used.
2. There was no harmful degradation of electrical properties of the oil.
3. Conductors ran cooler when insulated with Synthinol 901, permitting a 7% increase in current rating of the lead cables.
4. The use of Synthinol 901 in lieu of VC afforded substantial dollar savings.

3. Coil Leads.

Many manufacturers of small coils for use in electrical and electronic components had tried for years to use PVC insulated lead wires in their manufacturing operations. These coils, with leads attached, are put through a varnish or wax impregnation followed by a baking cycle. The baking cycles may be as long as 16 hours at temperatures as high as 105 C. In a great many of these cases PVC insulated lead wires had given trouble due to shrinkage, cracking, and stiffening during the impregnation and subsequent baking. Here is an application where Synthinol 901 has been doing an almost faultless job. After nearly eight years of wide usage, there has been no case of shrinkage, cracking, or stiffening of insulation reported where Synthinol 901 has been used in this application.

4. Panelboard wiring.

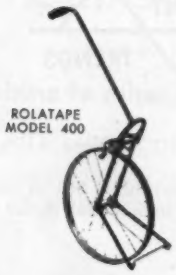
For many years panelboards and switchboards have been wired with Type TA wire. This wire has a layer of asbestos over a primary insulation of PVC. The asbestos has been used as a protection against the heat deformation which was known to occur at sharp bends and points where wiring was held under clamps. Transformer and machine tool manufacturers have found that the superior resistance of Synthinol 901 makes the asbestos covering unnecessary. In this application, for additional safety, the insulation thickness is normally $\frac{1}{64}$" heavier than standard. These manufacturers have found Synthinol 901 to be an economical solution to their particular needs.

These case histories are only a few of the applications where this unusual compound has served well. Synthinol 901 has been proven by test and actual use to be superior to conventional PVC compounds in the following ways:

1. Suitable for continuous operation at higher temperatures.
2. More stable under severe heat cycling.
3. Suitable for continuous immersion in hot transformer oil.
4. Superior resistance to chemicals and solvents.
5. Greater resistance to heat deformation.

All of our experience and knowledge in this field is available to you. If you have a wire and cable problem where you think Synthinol 901 might prove useful, why not let us help you?

ROME CABLE CORPORATION, Rome, New York


ROLATAPE MODEL 400

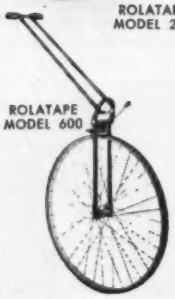
ROLATAPE is the Fast, Efficient, Economical, Modern way to measure. Model #400 is widely used by Road Construction Companies, Telephone Companies, Utilities, Sewage Departments and many other industries where measurements are important.

MEASURING time is cut to a fraction with Rolatape. Model #200 is extremely popular with Real Estate Men, Appraisers, Traffic Officers and many others who demand fast, accurate, measurements.

WHEELS on all Rolatapes are precision calibrated, and can be depended upon for long-life service. Model #600 is a special model for long-distance, acreage measuring and for use over rougher terrain.

ROLATAPE MODEL 200

FOR FAST, ACCURATE measuring—Rolatape Measuring Wheels are the answer. Models #400 and 600 measure distances up to nearly nineteen miles.


ROLATAPE MODEL 600

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HOLE DIGGER

The modern way to dig holes. No expensive installation. Fits on any A frame. Equipped to dig holes 8' deep and up to 20" in diameter. One man operates digger as all controls are mounted on machine. Available in 8-HP and 14-HP models. Auger is cleaned by spinning. Digs anchor holes with ease. Write for full information. Film of machine in operation available on request.

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CEDAR POINT, KANSAS

SALES ASSIGNMENTS

COMPANY STAFFS

Allis-Chalmers Manufacturing Co's Industries Group has named James C. Breth sales representative at Chattanooga, Tenn., and James F. Cooke sales representative at Richmond, Va.

Crouse-Hinds Co has designated Gordon Van Dyke Miller as division manager of its Philadelphia Sales Division.

General Electric Co's Large Lamp Department has named the following district sales managers: James W. Billings, Pacific, covering northern California, most of Nevada, and the Hawaiian Islands; Ted P. Brown, Michigan, covering Michigan's lower peninsula; Robert J. Diefenthaler, Chicago; Paul H. Ganther, New York Sales; D. Jefferson Faulkner, Jr, Florida, covering all of Florida; and Robert F. Herzer, Indiana, covering most of Indiana . . . J. F. Fuller is new Rocky Mountain district manager of application engineering user sales, Apparatus Sales Division . . . J. Frank McElwee, Jr, has become district manager of the recently formed South Atlantic district with headquarters in Charlotte, N. C. He is succeeded as manager of Tennessee user industries sales by Matthew O. Troy, Jr.

Westinghouse Electric Co has named F. G. Roehrig manager of the Milwaukee district of appliance sales.

REPRESENTATIVES

Royal Electric Manufacturing Co has appointed R. G. Robbins as Pennsylvania representative, with offices in Pittsburgh.

Hotpoint Co has appointed Graybar Electric Co as new franchised distributor for appliances and television in the Erie, Pa., area.

Standard Transformer Co has designated Elgin B. Robertson, Inc, as its representative in Texas. The firm has offices in Dallas and Houston.

Automatic Switch Co has named Lakeland Engineering Equipment Co of Minneapolis, Minn., as authorized stocking distributors of ASCO solenoid valves.

Pittsburgh Reflector Co has appointed the L. V. Walker Co as sales representatives for the San Francisco territory of the complete line of Permaflector fluorescent and incandescent lighting equipment on the West Coast.

Radio Corporation of America's commercial electronic products has named four firms as distributors for RCA closed-circuit television equipment and systems. They are Eastern Theatre Supply Co, Inc, Buffalo, N. Y.; Ernie Forbes Theatre Supply, Detroit, Mich.; Lake Service Corp, Boston, Mass.; and J. A. Walsh & Co, Houston, Tex.

Rome's lightweight Triplex goes up much faster than open-wire service drops

Reduce your service-drop installation time—even by a few minutes—and you save money. Now it's possible to speed up practically every job.

High dollar savings. Rome's aluminum Triplex can be installed much faster than open-wire service drops. Multiply the time it saves by the high cost of keeping your crew on the job, and you'll see how great the savings are in manpower costs alone.

Why such savings are possible. The lightweight construction of Rome's aluminum Triplex is behind these important savings. This single-cable assembly weighs less than conventional copper three-wire service drops, so it's easier to handle and quicker to install.

Rome's aluminum Triplex offers simplicity in construction. A self-supporting cable, it consists of specially insulated power conductors spiralled around a "straight-away" neutral conductor. Less handling is required to pull it off the truck, string it, and connect it than conventional three-wire service drops.

You can purchase this economical service drop cable in handy 500-foot cartons, paper-wrapped coils, or on non-returnable reels.

Specify Rome's aluminum Triplex for your next job. Contact your nearest Rome Cable representative for more information—or write to Department 366-B and ask for Bulletin RCP-361. Rome Cable Corporation, Rome, N. Y.

Plus these benefits!

Costs Less. Initial cost is lower than conventional copper Type SD service drop cable.

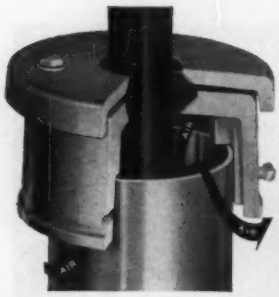
Lasts Longer. Maintenance and service interruptions are few compared to open-wire installations. It offers maximum resistance to storms, wind and ice loading.

Fewer Poles Required. Fewer poles are required and longer spans are possible with mid-span taps on secondary Triplex.

Less Hardware Needed. Service tap connections at the pole require less hardware than a conventional three-wire tap.

ROME CABLE

CORPORATION

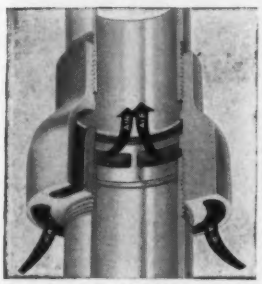


less HEAT more LOAD

FOR CABLE IN CONDUIT...WITH

PLM

CONDUIT VENTILATING CABLE SUPPORTS



Type BCV Conduit Ventilator provides air intake at base of conduit riser. May also be used at base of vertical splice between cable in conduit and armored cable, with PLM Splice Kit.

● Don't let bottled-up heat limit the load capacity and service life of cable in conduit! PLM Conduit Ventilating Cable Supports provide cooling air circulation . . . permit heated air to escape from cable risers in conduit where heat tends to build up. Watertight seal keeps water out.

Ventilating supports for top of riser supplied in types for new or existing installations, with or without flanges to support potheads. Write for full details, as well as information on PLM armored cable fittings, terminating and splicing kits, contained in PLM Catalog 301.

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WIRE AND CABLE FITTINGS AND ACCESSORIES

KEES

SOCKET METER COVER

Fits all standard "S" Type meters

Made from 16 gauge zinc-coated, rust resistant steel and finished in gray baked-on enamel, the KEES Socket Meter Cover is designed to prevent breakage of glass on socket meters and to insure long service in any climate. Outside diam.—8" and depth—5⅝" and over. Metal cover is also reported to minimize damage from excessive current surge due to electrical storms.

Write P. O. Box 660 for Free Electrical Catalogue

F. D. KEES MFG. CO.
BEATRICE NEBRASKA

Since 1874

Plant Remotely Controlled

(*Continued from page* 83)

on while the unit is shut down and is released only by the opening of the knife switch.

2. Time delay relay 14Y closes its contact after being energized for 2 min and energizes the 3-way governor oil valve solenoid coil, 65. This admits air to the diaphragm valve, which closes and locks the oil in the receiver. Opening of the knife switch de-energizes the solenoid coil and thus opens the valve.

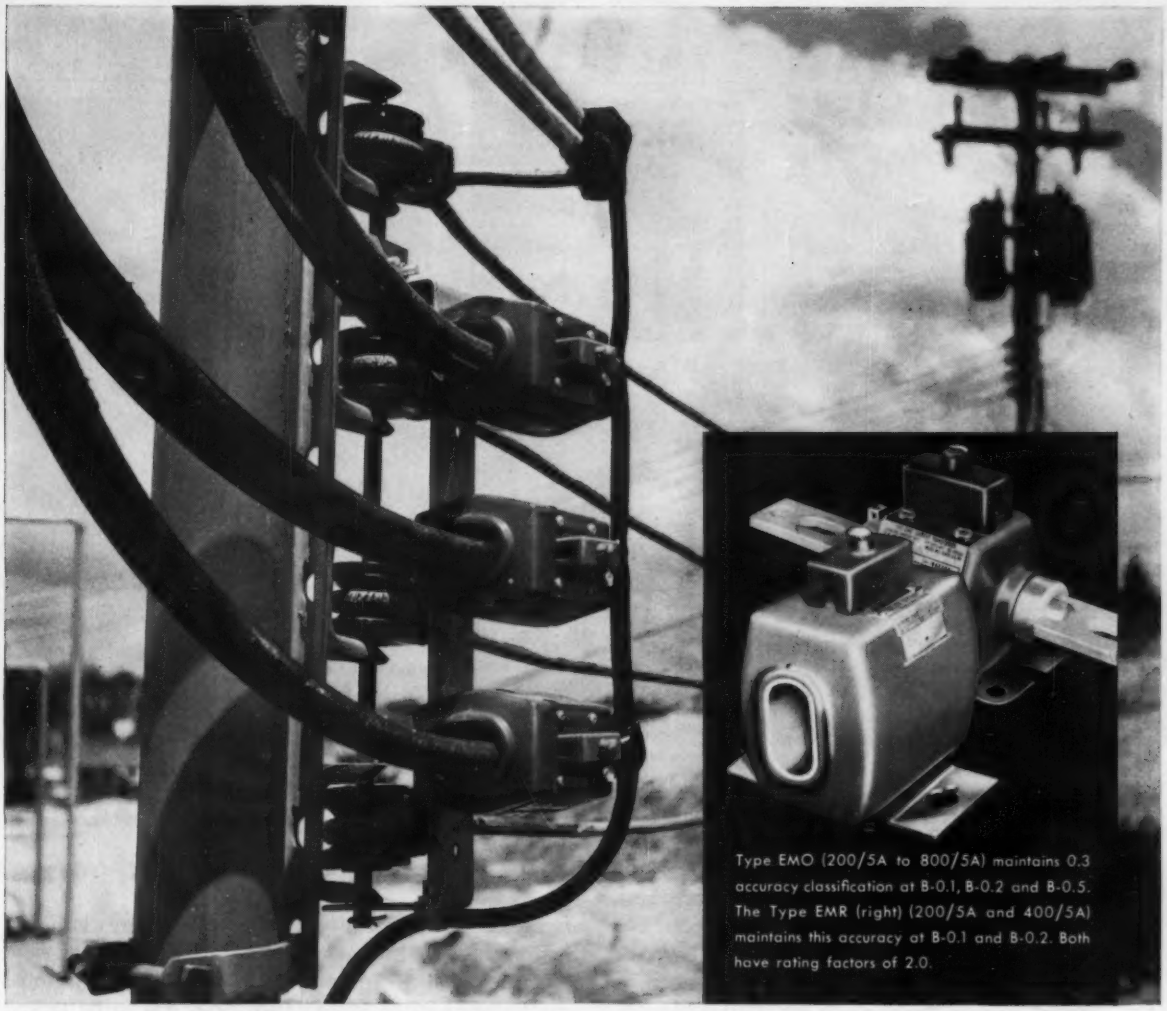
Some difficulty was encountered in placing the units on automatic control. The first source of trouble was excessive leakage past the turbine gates with the governors in the closed position. This resulted in minimum speeds above the desired values for application of the brakes (about 50% of synchronous speed). This situation was corrected by overhauling the gate mechanisms.

The next source of trouble was with the turbine governing mechanism of No. 1 unit. When the hydraulic oil pressure dropped to atmospheric, due to leakage past the piston of the hydraulic cylinder, the gates "floated" to 12% opening. This was corrected by clamping a 250-lb counterweight on the gate shaft.

The next difficulty involved excessive leakage past the pistons of the brake cylinders. No lubricators or filters had been installed with the cylinders. For that reason, the first thought was that the leakage was due to dry piston packing or possible damage from foreign material. Combination filter-lubricators with No. 10 oil were put in the lines ahead of the solenoid valves.

This appeared to reduce the leakage. But shortly after the filter-lubricators were installed the No. 1 unit brakes shut the unit down by false operation. The only explanation was that excessive leakage resulted in a practically balanced pressure across the piston. Because the piston rod reduced the effective area of the upper side of the piston, there was a greater total pressure on the bottom side and the piston moved upward. Cylinders were removed, further work was done and they were returned to service.

Both units have since operated satisfactorily on remote shutdown.



Type EMO (200/5A to 800/5A) maintains 0.3 accuracy classification at B-0.1, B-0.2 and B-0.5. The Type EMR (right) (200/5A and 400/5A) maintains this accuracy at B-0.1 and B-0.2. Both have rating factors of 2.0.

EMO's mounted on TMB-3 Brackets (Patent Pending). Brackets manufactured by B & C Metal Stamping Co., Atlanta, Georgia.

EMO Indoor/Outdoor Metering Transformer . . . 600-Volt Class, 200-800 Amps

50% greater cable capacity

Now molded from a polyester elastomer insulating material, product of Westinghouse research, the Westinghouse Types EMR and EMO current transformers are *five ways superior to any comparable units.*

1. **50% Greater Cable Capacity**—exclusive obround primary opening—the EMO above (200/5A.) handles two 750 MCM cables, 50% more than comparable units. The EMR features a round primary opening, with optional, removable round or flat terminal bar.
2. **Positive, Permanent Cable Connections**—exclusive Ilsco-type secondary terminals (Underwriters' listed) with weatherproof covers provide more positive, permanent connections.
3. **Longer Life**—polyester molding gives outstanding protection against weather, and corrosive acid or alkali fumes. *These transformers are ideal for either indoor or outdoor installation.*
4. **Smaller, Lighter**—polyester molding, plus the new design, has reduced the size and weight of these units, simplifying installation.
5. **Unexcelled Thermal and Dielectric Stability**—physical flexibility is maintained at high and low temperatures.

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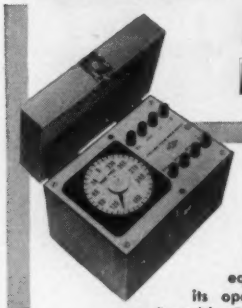

Completely self-contained, and requiring no auxiliary equipment for its operation, this Portable Phase Angle Meter offers a direct way of checking relay and instrument connections, particularly directional over-current relays, differential relays or similar equipment. It may also be used to measure the prevailing power factor in each phase of a polyphase watthour meter installation. The device has a frequency of 60 cycle, with voltage ranges of 60, 120 and 240 volt. Current ranges are 1, 2.5 and 5 amp. . . . DIMENSIONS: 9½ x 6¾ x 5⅝ inches. Weight 19 pounds.

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READERS FORUM

Woodpeckers Are Sharp but not Smart

To the Editor:

The picture (above) illustrates the persistence and determination of woodpeckers.

About five years ago 2x 2—19 gauge—70,000-psi hardware cloth was installed on our Sterlington-West Monroe 115-kv line. Instructions were that when woodpecker holes which did not weaken a pole enough to force its replacement were found, a patch of hardware cloth was to be tacked over the hole before the regular 4-ft width mesh was installed. This would give a double thickness over the hole.

In this case the hardware cloth patch was replaced by one of our regular aluminum pole caps, and then the pole was wrapped. The pole cap is 14 in. square and made of 0.016-in aluminum sheet.

The holes shown in the sheet were all that a woodpecker trying to get back into his old home could accomplish. When you consider that all of these holes were made through the ½-in. holes in the mesh (which was not cut), you wonder why the bird didn't realize that it would have to first cut through the mesh.

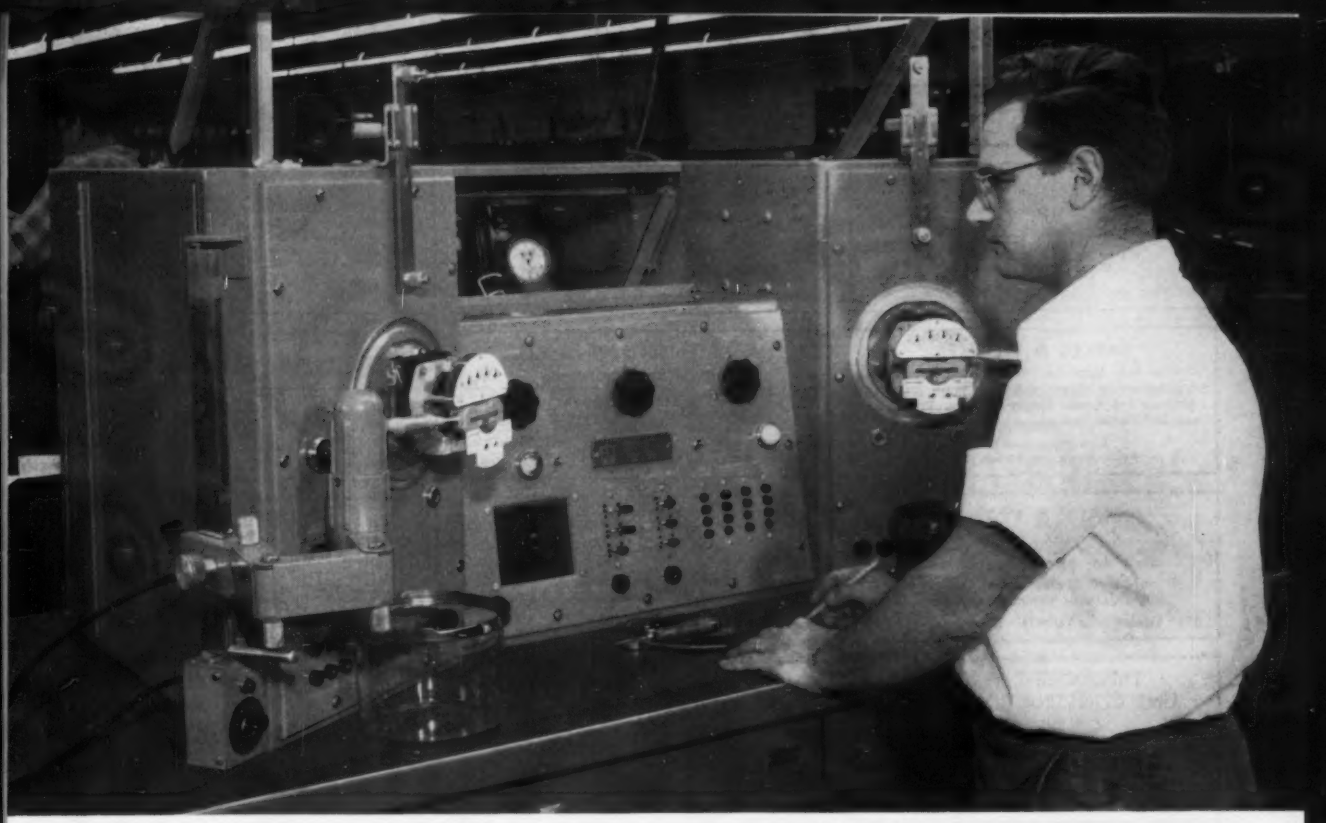
After more than five years and several hundred miles of experience, we still find the 19 gauge, 70,000-psi minimum 2x2 hardware cloth is 90% effective.

W. L. Rush
T&D Engineer

Louisiana P&L Co
New Orleans, La.

EDITOR'S NOTE:

On the credit side, pileated woodpeckers swarmed to the rescue of millions of acres of spruce timber attacked by Engelmann's spruce beetles in the Colorado-Utah area. The woodpeckers arrived when the varmints were destroying the trees at an alarming rate. They speared the beetles with their doubly barbed tongues, and brought the pest under control.



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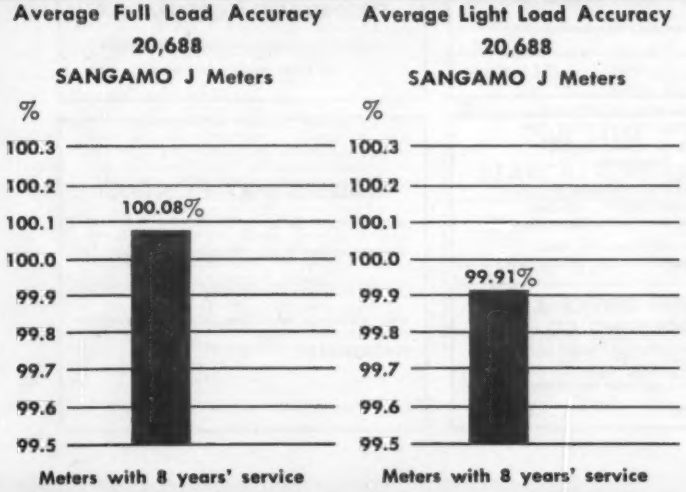
We think that you will be surprised—and pleased with the performance of the Sangamo Meters on your lines.

Shown below are meter accuracy records from one large operating utility that show the average full load accuracy and the average light load accuracy of more than 20,000 Sangamo J Meters after 8 years of service.

Such sustained accuracy is characteristic of Sangamo Watthour Meters. And such sustained accuracy is the reason why the J2 is your best investment in a watthour meter.

Actual performance records of 20,688 J Meters after 8 years service



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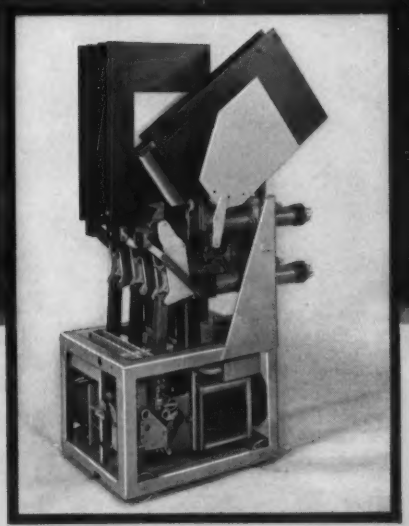

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